LAPITSKIY, A.V.; GELETSEANU, I.; BERAN, M.

Complex formation of thorium with some hydroxycarboxylic acids. Radiokhimiia 4 no.6:672-677 '62. (MIRA 16:1)
(Thorium compounds) (Acids, Organic) (Ion exchange)

GELETSEANU, I.; LAPITSKIY, A.V.

Study of thorium complex formation by methods of ion exchange, infrared spectroscopy, and nuclear magnetic resonance. Dokl.AN SSSR 144 no.3:573-575 My '62. (MIRA 15:5)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova. Predstavleno akademikom S.I.Vol'fkovichem.

(Thorium compounds)

S/186/63/005/002/004/005
E075/E136

AUTHORS: Lapitskiy, A.V., Geletseanu, I., and Mink, Ya.

TITLE: Investigation of the complex formation of thorium with mandelic and α-oxyisobutyric acids

PERIODICAL: Radiokhimiya, v.5, no.2, 1963, 249-258

TEXT: The complexing with the acids was examined with a view to their utilization as eluants in the purification of Th by ion-exchange methods. To this end the adsorption of ^{234}Th was studied on cation exchanger resin Dowex 50 and 5 in the Na form. The work was carried out at the pH's of 1.75 to 2.5 to minimize the adsorption of Th on glass and because at this pH range the distribution coefficients were sufficiently large. The instability constants were calculated at pH = 2.2 by two methods, of which the method of S. Froneus (Acta Chi., Scand., v.4, no.1, 1950, 72) was considered the more reliable. The first instability constants for mandelic and α-isobutyric acid were 1.82×10^{-3} and 3.83×10^{-5} respectively. The second constants were 0.67×10^{-5} and 2.44×10^{-6}, and the third constants 1.92×10^{-7} and 8.34×10^{-9} respectively. Changes in the concentration of mandelic acid from

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0.01 to 0.1 M decrease the distribution coefficient by two orders of magnitude and a similar trend is shown for α-oxyisobutyric acid. The first complex $[Th\ A]^{3+}$ forms at the concentration of addend of 2×10^{-3} M. During further increases of the concentration up to about 10^{-2} M the composition of the complex changes to $[Th\ A_2]^{2+}$, $[Th\ A_3]^{+}$ and $[Th\ A_{3.5}]^{0.5+}$. In general, α-oxyisobutyric acid forms more stable complexes than mandelic acid and therefore is a more suitable eluent for the isolation of Th by ion exchange methods.
There are 13 figures and 7 tables.

SUBMITTED: January 18, 1962

LAPITSKIY, A.V.; GELETSEANU, I.

Study of protactinium complex formation with mono-, di-, and polycarboxylic acids by the ion exchange method. Part 2: Complex formation of protactinium with α-hydroxybutyric and amygdalic acids. Radiokhimiia 5 no.3:330-334 '63. (MIRA 16:10)

(Protactinium compounds) (Acids, Organic)

S/020/63/149/003/023/028
B117/B186

AUTHORS: Moskvin, A. I., Geletseanu, I., Lapitskiy, A. V.

TITLE: Some regularities of complexing of pentavalent actinides

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 149, no. 3, 1963, 611-614

TEXT: On the basis of compositions and instability constants of complexes of pentavalent Pa, Np and Pu with anions of some acids (determined by means of the ion exchange method), the tendency of these elements to form complexes was shown to be much stronger than is generally supposed. This tendency is much the same for the elements mentioned, as they form complexes of identical composition and approximately identical stability with anions of suitable acids. The tendency of the addends to form complexes decreases according to the following sequence:
$\gamma^{4-} > Cit^{3-} > HPO_4^{2-} > tart^{2-} > Ac^- \simeq Lact^-$. The stability of the complexes of Pa(V) with hydroxy acids permits generalization of this sequence as follows: EDTA > citric acid > oxalic- > phosphoric- > trioxyglutaric > α-hydroxyisobutyric > tartaric > malic > mandelic > acetic > lactic acid.

Some regularities of ... S/020/63/149/003/023/028
B117/B186

Although no complete data exist for Np(V) and Pu(V), this sequence can also be applied for these elements owing to conformance of instability constants. Instability constants of complexes formed by Pu of different valence with the same addend show that Pu in the pentavalent state has the weakest tendency to form complexes. On the basis of the similarity of complexing properties of pentavalent Pa, Np and Pu, and of the quantitative data available, conclusions may also be drawn as to the composition and stability of complexes of pentavalent uranium with the acids mentioned. One of the properties of actinides which serves to prove their position in the periodic system of elements is their behavior during ion exchange. Pa, Np and Pu in pentavalent state were found to behave similarly during ion exchange. There are 1 figure and 1 table.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

PRESENTED: October 29, 1962, by I. I. Chernyayev, Academician

SUBMITTED: October 24, 1962

Card 2/2

GELETSEANU, I.; LAPITSKIY, A.V.; VEYNER, M.; SALIMOV, M.A.; ARTAMONOVA, Ye.P.

Thorium acetates. Radiokhimiia 6 no. 1:93-101 '64. (MIRA 17:6)

GELETSEANU, I.; LAPITSKIY, A.V. [deceased]

Complex formations of actinide elements. Radiokhimiia 7 no.3:280-283 '65. (MIRA 18:7)

L 10270-66 EWT(m)/EWA(d)/EWP(j)/T WW/DJ/RM

ACC NR: AP5028366 SOURCE CODE: UR/0369/65/001/005/0527/0530

AUTHOR: Gorokhovskiy, G. A.; Geletukha, G. N.

ORG: Kiev Institute of Civil Aviation Engineers (Kiyevskiy institut inzhenerov grazhdanskoy aviatsii)

TITLE: Mechanical-chemical dispersion of metals in dynamic contact with polymers

SOURCE: Fiziko-khimicheskaya mekhanika materialov, v. 1, no. 5, 1965, 527-530

TOPIC TAGS: mechanical failure, metal property, polymer, polymer physical chemistry

ABSTRACT: The authors discuss some of the results obtained earlier on the mechanical-chemical processes in the metal-polymer contact region. Under laboratory conditions, the working surfaces of textolite samples showed microscopic particles of a metal with a considerably greater hardness than that of the metal of the roller in contact with the samples. An analysis of other data, as well as the results of earlier experiments on the dispersion of metal powders in contact with polymers, led the authors to the assumption that the surface layers of polymers are conducive to the strengthening and brittle fracture of the metal surfaces which are in dynamic contact. In this connection, the authors conducted investigations to determine the role of the polymer in the process of dispersion of the surface layers of the metal. Comparative tests were made on the dispersion of iron in a ball mill with a polymer (emulsion polyethylene, 5% by wt.) and without a polymer. The experimental data show that, in the process of mechanical load the polymer particles are chemically activated and

L 10270-66

ACC NR: AP5028366

interact with the exposed crystal surfaces of the metal, which causes the intensive dispersion of the metal. Apparently, the chemical activation of the polymer is due to the mechanical destruction of its macromolecules and the formation of free radicals during this process. Other experiments showed that polymers, at the instant of their destruction, have a considerably higher capability for affecting the dispersion of metals than surface-active substances. It is established, therefore, that a high-molecular substance at the instant of mechanical cracking is capable of activating the process of deformation and the destruction of a metal. The practical observation of wear of the working surfaces of metal parts working in contact with plastics testifies to the mechanical cracking of macromolecules of the polymer. Orig. art. has: 5 figures.

SUB CODE: 11 / SUBM DATE: 24Apr65 / ORIG REF: 009 / OTH REF: 002

Card 2/2

GOROKHOVSKIY, G.A.; GELETUKHA, G.N.

Mechanical and chemical dispersion of metals in dynamic contact with polymers. Fiz.-khim. mekh. mat. 1 no.5:527-530 '65. (MIRA 19:1)

1. Kiyevskiy institut inzhenerov grazhdanskoy aviatsii. Submitted April 24, 1965.

L 61517-65 EWT(m)/EWA(d)/EPF(c)/EPR/EWP(j)/T/EWP(t)/EWP(z)/EWP(b) Pc-4/
Pr-4/Ps-4 JD/RM/WW/DJ
ACCESSION NR: AP5012658 UR/0369/65/001/002/0231/0236

AUTHOR: Gorokhovskiy, G. A.; Geletukha, G. Ye.; Kravchenko, V. G.

TITLE: Effective use of antifriction materials with high molecular weight and accompanying phenomena

SOURCE: Fiziko-khimicheskaya mekhanika materialov, v. 1, no. 2, 1965, 231-236

TOPIC TAGS: polymer, metallopolymer material, antifriction material

ABSTRACT: The authors discuss fields where antifriction materials may be used and explain the processes which accompany operations using polymers as antifriction materials. The most efficient use of polymers may be in friction assemblies which operate without radiant heat transmission and without seizing of the bearings. Antifriction materials of metallopolymeric composition have recently come into use. These consist of a porous metal base filled with a polymer. The action of polymer protectors must depend on the chemical composition and molecular structure of the polymer. The capacity of high molecular materials to form counterbodies of anti-scratching film with slight resistance to shearing makes them useful in machines operating in non-acid media. Metallopolymers do not operate successfully when there

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L 61517-65

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ACCESSION NR: AP5012658

are electrolytic impurities in the lubricant. Orig. art. has: 4 figures, 1 table.

ASSOCIATION: KIGA, Kiev

SUBMITTED: 15Oct64 ENCL: 00 SUB CODE: MT, OC

NO REF SOV: 009 OTHER: 001

Card 2/2

TROPCHEVA, Iia, inzh.; CHAUSHEVA, Elka; GELEV, B.; NACHEVA, S.

Modern organization of the production of men's woolen clothes. Tekstilna prom 12 no. 6:4-8 '63.

1. Nauchni sutrudnitsi pri Nauchnoizsledovatelskiia institut po tekstilna promishlenost, Sofiia.

LAZAREV, Nikolay Valentinovich; AYZEN, A.M., inzh., retsenzent; GELEV, G.N., retsenzent; NIKIFOROVA, R.A., inzh., red.; GORNOSTAYPOL'SKAYA, M.S., tekhn. red.

[Tables of dimensions for designing the profile of sprocket-wheel teeth; handbook] Tablitsy razmerov dlia postroeniia profilia zub'ev zvezdochek; spravochnik. Moskva, Mashgiz, 1962. 117 p. (MIRA 15:7)

(Chains—Tables, calculations, etc.)

GELEV, Georgiy Naumovich; AYZEN, Arkadiy Markovich; KARPOVTSEV, Artem Nikolayevich; VASILENKO, A.A., doktor tekhn.nauk, retsenzent; NIKIFOROVA, R.A., inzh., red.; GORNOSTAYPOL'SKAYA, M.S., tekhn. red.

[Handbook for designing chain transmissions] Spravochnik po raschetu tsepnykh peredach. Moskva, Mashgiz, 1962. 171 p. (MIRA 15:6)

(Chains)

GELEV, I. and GENOV, I.

"A case of hog cholera."

Veterinariya, Vol. 37, No. 10, 1960, p. 39

Bulgaria

GELEV, I.; GENOV, I.

A case of hog cholera. Veterinariia 37 no.10:39-40 O '60.
(MIRA 15:4)

1. Rayonnaya veterinarnaya stantsiya, Ruse, Bolgariya.
(Bulgaria--Hog cholera)

GELEVERI, V.I.; POLUYEKTOVA, I.A.; SHOSTAK, I.P.

Investigating drawing conditions and properties of wire made of oxygen-blasted converter steel. Biul. TSNIICHM no. 10:46-48 '58.

1. Nizhnedneprovskiy zavod metallicheskikh izdeliy.
(Wire drawing)

GELEVERYA, I., kapitan 3-go ranga

Son of the regiment. Voen. vest. 41 no.3:63-66 Mr '62.
(MIRA 15:4)

(Radar, Military)

GELEVERYA, I., podpolkovnik; KOLINICHENKO, A., kapitan

Instructor of the political section of a unit. Komm. Vooruzh. Sil 3 no.8:60-65 Ap '63. (MIRA 16:5)
(Russia--Armed forces--Political activity)

GEL'FAN, Ye.M. (Kaluzhskaya oblast')

Conducting practical lessons in geometry in the classroom and on location. Mat.v shkole no.3:45-48 My-Je '55. (MLRA 8:7)
(Geometry--Problems, exercises, etc)

L 10972-66 EWT(1)/EWA(1)/EWA(b)-2 JK

ACC NR: AP5028398 SOURCE CODE: UR/0016/65/000/009/0096/0100

AUTHOR: Arkhangel'skaya, M. V.; Gel'fand, A. S.

ORG: Irkutsk Institute of Epidemiology and Microbiology (Irkutskiy institut epidemiologii i mikrobiologii)

TITLE: Epidemiological characteristics of the focus of tick-borne encephalitis in the sayan area (Irkutsk Oblast')

SOURCE: Zhurnal mikrobiologii, epidemiologii i immunobiologii, no. 9, 1965, 96-100

TOPIC TAGS: encephalitis, infective disease, disease incidence

ABSTRACT: The authors carried out epidemiological investigations during 1959-1962 in the steppe, forest-steppe, and taiga areas of the Cheremkhovsk region of Eastern Sayan. These investigations revealed that the degree of contact of the population of these various areas with the natural focus of tick-borne encephalitis is intimately associated with the character of its economic activity and living conditions. It is suggested that for the population of villages involved in the lumber industry the living conditions lay at the base of this contact with the focus, whereas for the population of villages involved in the wood-products industry, the industrial factor played the major role. The authors deem it expedient to differentiate the system of prophylactic measures for the populations involved in the different industries: for the wood-products workers the measures should include vaccination and the creation of tick-free zones around the populated points and for the forestry workers measures should be taken

Card 1/2 UDC: 616.988.25-022.395-036.2 (571.53)

L 10972-66

ACC NR: AP5028398

to eradicate the ticks at places most frequently visited by the inhabitants for household purposes. A correlation was found between the immunological indices (by the complement-fixation test) and the zoo-parasitological indices of the intensity of the natural focus (number of ticks, number of ticks carrying viruses) for various years. Orig. art. has: 2 tables.

SUB CODE: 06 / SUBM DATE: 04Mar64 / ORIG REF: 003

Card 2/2

ARKHANGEL'SKAYA, M.V.; GEL'FAND, A.S.

Epidemiological characteristics of a focus of tick-borne encephalitis in the Sayan Mountain region (Irkutsk Province). Zhur.mikrobiol., epid. i immun. 42 no.9:96-100 S '65. (MIRA 18:12)

1. Irkutskiy institut epidemiologii i mikrobiologii. Submitted March 4, 1964.

Gel'fand, A. Ye.

USSR/ Engineering - Conferences

Card 1/1 Pub. 128 - 16/31

Authors : Gel'fand, A. Ye., Engineer; Chernavskiy, G. N.; and Futoryan, S. B., Cand. Tech. Sc.

Title : High-speed cutting with greater rates of feed

Periodical : Vest. mash. 35/5, 43-47, May 1955

Abstract : Minutes are presented from the special technical conference held in Moscow (1954) at which different problems of high-speed metal cutting with a greater feeding rate were discussed. Names of participants and the institutions they represented are listed. Tables; graphs; drawings.

Institution : .....

Submitted : .....

GEL'FAND, A.YE., inzhener.

Modern methods of obtaining optimum surface smoothness on machine parts. Mech.transp. 15 no.8:25-30 Ag '56. (MLRA 9:11)
(Metals--Finishing) (Surfaces (Technology))

FUTORYAN, S.B., kand. tekhn. nauk; red.; GEL'FAND, A.Ye, inzh., red.; SUVOROVA, I.A., red. izd-va; PUKHLIKOVA, N.A., tekhn. red.

[Cutting with powdered metal tools; a collection of papers at a technical meeting] Rezanie mineralokeramicheskimi instrumentami; sbornik dokladov nauchno-tekhnicheskoi sessii. Moskva, Gos. izd-vo obor. promyshl., 1958. 206 p. (MIRA 11:8)

1. Nauchno-tekhnicheskoye obshchestvo mashino-stroitel'noy promyshlennosti. Moskovskoye otdeleniye.
(Cermets) (Metal-cutting tools)

S/121/60/000/012/003/015
A004/A001

AUTHOR: Gel'fand, A. Ye.

TITLE: The Grinding of Carbide Die Parts With Diamond Wheels on Surface and Circular Grinding Machines

PERIODICAL: Stanki i Instrument, 1960, No. 12, pp. 6-9

TEXT: According to investigations carried out by the VNIITS it was found that the best sintered tungsten carbide grade for the manufacture of blanking die parts is the ВК20 (VK20) grade. Moreover, it was found that the most efficient method of finish machining of sintered carbides is the grinding by diamond wheels, ensuring an accuracy of up to the 1st class inclusively and a surface finish up to the 13th class. To find out the most favorable characteristics of diamond wheels and diamond grinding conditions, surface and cylindrical grinding of blanking die parts made of VK20 sintered tungsten carbide have been studied by the NIIAmaz. VK20 specimens with the dimensions 47 x 59 x 30 mm and control specimens of 4 x 4 x 40 mm were preliminarily machined with the КЗ46-60 СМ1К (KZ46-60 SM1K) wheels. Then they were ground with diamond wheels cooled with a 3% soda solution. The following points were investigated: 1) surface finish (the specimens were

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S/121/60/000/012/003/015
A004/A001

The Grinding of Carbide Die Parts With Diamond Wheels on Surface and Circular Grinding Machines

checked with the ПЧ-2- PCh-2-profile gage); 2) absence of cracks (checking was effected with a magnifying glass of 20 diameters magnification and with a metallographic microscope of 100 diameters magnification); 3) machining productivity in mm^3/min (the quantity of carbide removal was determined with a micrometer, while the machining time was measured with a stopwatch); 4) specific wear q of the diamond wheels in milligram/gram of sintered carbide. The tests were carried out with АПП (APP) 200 x 10 x 75 diamond wheels which were bakelite-bonded and had a grain size of 150, 180, and 240 respectively. To find out the most favorable concentration, bakelite-bonded APP-wheels with 25, 50, and 100% concentration were tested. As a result of the tests it was established that bakelite-bonded wheels with 50% concentration of 180-mesh diamonds showed the best characteristics for surface and circular grinding, producing sharp cutting edges and high surface finish. Optimum conditions for surface grinding with cooling were: depth of cut t = 0.03 mm, longitudinal feed s_{long} = 3 m/min, cross feed s_{cross} = 0.6 mm per run; wheel speed v_k = 29 m/sec. The respective figures for cylindrical grinding are: depth of cut - 0.01 mm, longitudinal feed 0.5 m/min, working speed - 12.5 m/min. The specific wear of diamond wheels at optimum wheel characteristics and grinding

Card 2/3

S/121/60/000/012/003/015
A004/A001

The Grinding of Carbide Die Parts With Diamond Wheels on Surface and Circular Grinding Machines

conditions under laboratory conditions amounted to 0.8 milligram/gram, using VK20 sintered tungsten carbide with cooling on surface grinding machines. The respective figure for circular grinding is 2.14 milligram/gram. If it is necessary to use for the surface grinding of VK20 carbides 180-mesh diamond wheels with 25% concentration and organic bond, the following grinding conditions are recommended: depth of cut T = 0.03 mm; longitudinal feed s_{long} = 2 m/min; cross feed s_{cross} = 0.4 mm per run. The surface grinding of VK20 carbides with 180-mesh diamond wheels with 100% concentration with organic bond makes it possible to increase the machining productivity, but, on the other hand, the wear of the diamond wheels is also increased considerably. The optimum machining conditions for wheels with 100% concentration are: depth of cut t = 0.04 mm, longitudinal feed s_{long} = 4 m/min, cross feed s_{cross} = 0.6 mm per run. The optimum conditions for circular grinding operations with 180-mesh diamond wheels of 50% diamond concentration with organic bond are the following (grinding with cooling): depth of cut t = 0.01 mm per 5 table strokes, longitudinal feed s_{long} = 0.5 m/min and working speed 12.5 m/min. There are 7 figures.

Card 3/3

GEL'FAND, Aleksandr Yevseyevich, inzh.; GETSOV, Iosif Yefremovich, kand. tekhn. nauk; CHERNOV, M.I., retsenzent; DOLGOLENKO, P.V., retsenzent; TYUTCHEV, N.A., red.; VITASHKINA, S.A., red. izd-va; YERMAKOVA, T.T., tekhn. red.

[Precision and finish of the machining of parts in repairing ship machinery] Tochnost' i chistota obrabotki detalei pri remonte sudovykh mekhanizmov. Moskva, Izd-vo "Rechnoi transport," 1961. 151 p. (MIRA 14:12)

(Marine engines--Maintenance and repair)

22919
S/121/61/000/007/004/004
D040/D112

1 1100 2908

AUTHOR: Gel'fand, A.Ye.

TITLE: Diamond wheel grinding for hard-alloy mill rolls

PERIODICAL: Stanki i instrument, no. 7, 1961, 28-31

TEXT: Hard-alloy rolling mill rolls could not be finished to the required class 12 mirror finish at the Leningradskiy staleprokatnyy zavod (Leningrad Steel Rolling Plant) and Beloretskiy provolochno-kanatnyy zavod (Beloretsk Wire Rope Plant). The diameter tolerance for these rolls is 0.005 mm; finish-grinding КЗ60СМ2К (KZ60SM2K) wheels and superfinishing were employed. The rolls were dull, and the rolled metal had to be polished after rolling. This was the reason why hard-alloy rolls were not much used despite their advantages and the fact that they had a 20 - 50 times higher wear resistance than steel rolls. NIIAlmaz conducted experiments with diamond wheel grinding at the Leningrad Steel Rolling Plant and achieved the required mirror finish. The article contains a detailed description of the experiments and their results, and final recommendations. The experiments consisted in grinding ВК8 (VK8) alloy experimental rolls 70 mm in diameter and 30 mm long, by means of a grinding machine with 2800 rpm spindle velocity and
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22919

S/121/61/000/007/004/004
Diamond wheel grinding for hard-alloy mill rolls D040/D112

АПП 200x10x75 (APP200x10x75) diamond wheels with an organic bond. The coolant consisted of 0.60% sodium triphosphate, 0.10% sodium nitrate, 0.05% vaseline oil, 0.30% borax, 0.25% calcined soda, and 98.70% water. Class 12 mirror finish was obtained by diamond wheels with a granularity АМ-10 (AM-10) and a 50% diamonds concentration; the wheel speed was 29.3 m/sec, roll velocity 30 m/min, cutting depth 0.0025 mm and longitudinal feed 0.3 m/min. Fifteen last-finish passes were made. Diamond wheel grinding resulted in a reduction of labor-consumption of up to 8 times in the finishing operations and eliminated cracking caused by green silicon carbide wheels. Polishing after rolling was no longer necessary. There are 12 figures.

Card 2/2

POPOV, S.A.; GEL'FAND, A.Ye.

Stresses generated by surface grinding of hard alloys with diamond wheels. Stan.i instr. 32 no.11:35-36 N '61. (MIRA 14:10)
(Grinding and polishing)

GEL'FAND, A.Ye., inzh.; NOVGORODOV, A.S., inzh.; FOTEYEV, N.K., kand. tekhn. nauk; CHETVERIKOV, S.S., doktor tekhn. nauk, prof., retsenzent; IVANOVA, N.A., red. izd-va; SMIRNOVA, G.V., tekhn. red.

[Machining of hard alloys] Obrabotka tverdykh splavov. Moskva, Mashgiz, 1963. 243 p. (MIRA 16:5)
(Ceramic metals) (Metal cutting)

PHASE I BOOK EXPLOITATION SOV/6436

Gel'fand, A. Ye., Engineer, A. S. Novgorodov, Engineer, and N. K. Poteyev, Candidate of Technical Sciences

Obrabotka tverdykh splavov (Machining of Hard Alloys) Moscow, Mashgiz, 1963. 246 p. Errata slip inserted. 7500 copies printed.

Reviewer: S. S. Chetverikov, Doctor of Technical Sciences, Professor; Ed. of Publishing House: N. A. Ivanova; Tech. Ed.: G. V. Smirnova; Managing Ed. for Literature on Cold Working of Metals and Machine-Tool Making: S. L. Martens, Engineer.

PURPOSE: This book is intended for engineering personnel of machine-building plants and planning and educational institutes.

COVERAGE: The book presents information on hard alloys, methods of making hard-alloy semifinished products, processes of abrasive, diamond, electrospark, and ultrasonic machining

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of hard-alloy tools (cutting tools, gages), parts of cutting and heading dies, rolling-mill rolls, etc. Recommendations for practical application are given, and machining conditions, tools, and equipment are described. Ch. I was written by A. S. Novgorodov; Chs. II and III, by N. K. Foteyev; and Chs. IV-VI, by A. Ye. Gel'fand. There are 74 references: 67 Soviet and 7 English.

TABLE OF CONTENTS:

GEL'FAND, A.Ye.

Grinding BK20 hard alloy with diamond wheels on metallic bond.
Stan.i instr. 34 no.1:30-32 Ja '63. (MIRA 16:2)
(Diamonds, Industrial)
(Grinding and polishing)

L 13261-65 EWT(m)/EWA(d)/EWP(t)/EWP(b) ASD(m)-3 MJW/JD
ACCESSION NR: AP4047656 S/0121/64/000/010/0033/0036

AUTHOR: Gel'fand, A. Ye.

B

TITLE: The effects of diamond wheel grinding regimes on the properties of the solid alloy VK20

SOURCE: Stanki i instrument, no. 10, 1964, 33-36

TOPIC TAGS: grinding, metal mechanical property/ APP200 disk, VK20 alloy

ABSTRACT: The effects of different operating regimes of diamond wheel grinding on the mechanical and surface properties of the alloy VK20 were experimentally investigated using disks (Type APP200x10x75) with bakelite bonding (B1) (50% diamond content, grain size A6) and metallic bonding M1 (100% diamond content, grain size A8) on 4.5 x 4.5 x 35 mm samples at a wheel speed of 30 m/sec. The samples were ground on all 4 sides and tested for strength in bending, impact strength, surface characteristics, and Rockwell hardness. Some samples were finished and polished to study subsurface (about 1 mm deep) effects. Tests with the bakelite bonded wheels were cooled with 6-7 liter/min of 3% soda solution. With longitudinal feed of 3.0 m/min and transverse feed of 0.5 mm/pass a change of grinding depth from t = 0.01 - 0.05 mm did not change the strength in bending. Changing the longitudinal feed from 2-5 m/min (0.5 mm/pass, t = 0.03 mm) only decreased the strength from

L 13261-65
ACCESSION NR: AP4047656

O

298 to 263 kg/mm^2. Changing the transverse feed from 0.2-1.5mm/pass (3 m/min, t = 0.03 mm) did not affect t_b, no cracks could be found, the hardness varied between 76-80 RA in all operating regimes, and the surface finish was class 9-10. Tests with the M1 bonded wheels were performed with and without cooling. Changing t = 0.03-0.08 mm with cooling and t = 0.02-0.05 mm without cooling (4 m/min, 0.5 mm/pass) showed no cracks but tear-outs increased from 3-30 micron depth and 20-50 micron depth for cooled and uncooled regimes respectively. Strength in bending decreased from 193 to 59 kg/mm and 120 to 65 kg/mm respectively while the impact strength decreased from 0.445 to 0.168 kgm/cm^2 and 0.450 to 0.062 kgm/cm^2 respectively. It was found that preliminary grinding should be performed with metal bonded wheels under conditions not exceeding v = 30 m/sec, longitudinal feed 4 m/min, 0.5 mm/pass, and t = 0.03 mm with cooling, and the final grinding should be done with bakelite bonded wheels. Orig. art. has: 7 figures.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00

SUB CODE: MM NO REF SOV: 004 OTHER: 000

Card 2/2

GEL'FAND, F.

Sections, commissions, committees. NTO 2 no.1:55-56 Ja '60. (MIRA 13:5)

1. Predsedatel' sektsii burovzryvnykh rabot Karagandinskogo oblastnogo pravleniya Nauchno-tekhnicheskogo obshchestva gornoye. (Technical societies)

GEL'FAND, F.M.

Investigating the better cartridge diameters in development mining. Nauch. trudy KNIUI no.2:55-65 '58. (MIRA 13:8)
(Coal mines and mining--Explosives)

GEL'FAND, F. M. Cand Tech Sci — (diss) "Investigation of the Short-delayed Explosion in Conducting Preliminary Workings in Mines of the Karaganda Basin," Alma-Ata, 1960, 17 pp, 200 copies Kazakh Polytechnical Institute) (KL, 49/60, 127)

GEL'FAND, F.M.

Similarity of rock breaking processes. Ugol' 35 no.5:57-60 My '60. (MIRA 13:7)

1. Karagandinskiy nauchno-issledovatel'skiy ugol'nyy institut.
(Karaganda--Boring)

GEL'FAND, F.M.

Making fuller use of the potentials of short-delay blasting.
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(Mining engineering)

GEL'FAND, F.M., inzh.; MARKMAN, L.D., inzh.; MUKHAMEDIN, S., tekhnik; MIKHAYLYUK, V.N., tekhnik

The RPM-2 bit for the rotary boring of holes in rocks. Shakht. stroi. 5 no. 3:12-14 Mr '61. (MIRA 14:2)

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Operating conditions of the vibration percussion mechanism of the VBU-1 drill. Nauch. trudy KNIUI no.13:332-335 '64 (MIRA 18:1)

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GEL'FAND, F.M., kand.tekhn.nauk

Using straight cuts as a means for increasing safety in blasting operations in Karaganda Basin mines. Ugol' 39 no.12:59-62 D '64. (MIRA 18:2)

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[Safety and effectiveness of blasting operations in category mines] Bezopasnost' i effektivnost' vzryvnykh rabot v kategornykh shakhtakh. Moskva, Nedra, 1965. 148 p. (MIRA 18:8)

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GELFAND, I. M.

"On Rings of Continuous Functions of Topological Spaces," Dok. AN, 22, No. 1, 1939.

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620007-6"

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GELFAND, I. M., FEYNBERG, S. M., FROLOV, A. S. and CHENTSOV, N. N.

"Concerning the Use of the Random Test Method (Monte-Carlo Method) for Solving the Kinetic Equation."

paper to be presented at 2nd UN Intl. Conf. on the Peaceful uses of Atomic Energy, Geneva, 1 - 13 Sept 1958.

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AUTHOR: GEL'FAND, I.M., TSETLIN, M.L.

TITLE: On the Quantities with Anomalous Symmetry and on a Possible Explanation of the Degeneration (with Respect to Symmetry) of K-Mesons.

PERIODICAL: Zhurnal Eksperimental'noi i Teoret.Fiziki, 1956, Vol 31, Nr 6, pp 1107-1109 (U.S.S.R.)

Received: 1 / 1957 Reviewed: 3 / 1957

ABSTRACT: Within the limits of experimental accuracy the rest masses of Θ- and τ-mesons are equal and this equality is called the "degeneration of K-mesons with respect to symmetry". In this connection the examination of the behavior of the corresponding quantities with reflections is of interest. Besides, such examinations are interesting themselves. Besides the well-known possible symmetries with respect to space and time reflections there is an additional possibility which is here called "anomalous symmetry".

It is purposeful to determine the transformations of the quantities with respect to one or the other group with an accuracy leaving one factor arbitrary. Well-known examples for the occurrence of such factors are the spinors or the wave functions of a system of particles which obey the FERMI statistics. The corresponding mathematical notions are the so-called projective representations of one group. Here the representation of a group

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On the Quantities with Anomalous Symmetry and on a Possible Explanation of the Degeneration (with Respect to Symmetry) of K-Mesons.

of reflections consisting of the following four elements is examined: the element of the unit and of the operators of the time-dependent, spatial, and time-space reflections. With transpositions of the operators T_t (a certain projective representation of the reflection groups) the quantities transformable by the operators of the representation have four possibilities of symmetry. The only additional possibility follows if the demand of transpossibility of the operators is renounced. Then the relations between the operators can be expressed by a matrix. In the simplest case, with the transformation of scalar quantities, the operators can be written in the form of three anti-commuting matrices of second order which are analogous to the well-known PAULI matrices. The quantities to be transformed ("scalars with anomalous symmetry" form numerical pairs which do not change during the transformation proper and which transform during reflections according to the matrices already mentioned. The irreducible representation of the LORENTZ group, together with the reflections, decomposes into two representations of the

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On the Quantities with Anomalous Symmetry and on a Possible Explanation of the Degeneration (with Respect to Symmetry) of K-Mesons.

LORENTZ group proper. Thereby four normal and one not normal possibilities exist. This and other considerations permit the subdivision of the particles into classes with normal and not normal symmetry. Attributing the not normal symmetry to the K-mesons and the normal one to the pions, the same normality would follow for the particles Λ , Σ just as for the particles n, Ξ . For this purpose the consideration of one reaction with strong reciprocal effect suffices. The K-meson can exist in two different states with different space symmetry and equal mass.

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Card 3/3

GELFAND, I. M.

3/8

Gelfand, I., and Neumark, M. Unitary representations of the Lorentz group. Acad. Sci. USSR. J. Phys. 10, 93–94 (1946).

This note announces that the authors have determined all the irreducible unitary representations of the homogeneous Lorentz group and of the isomorphic group of unimodular two dimensional matrices. The representations are (except for the trivial one) all known to be infinite dimensional. The unitary transformations of the representation are given in a form in which they transform functions of two real variables into other such functions and are given for the whole group rather than only for the infinitesimal part of it as was the custom hitherto. It appears that the determination of the representations which is announced is a rigorous one, while most previous work on this question lacked full mathematical rigor. However, it appears that the results corroborate the results which can be obtained by consideration of the infinitesimal operators.

E. P. Wigner (Princeton, N. J.).

Source: Mathematical Reviews, Vol 8, No. 3

GEL'FAND, I.M.; GRAYEV, M.I.

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Neprivodimyye unitarnyye predstavleniya lokal'no bikompaktnykh grupp. DAN, 42 (1944). 203-205.
Abstrakte funktionen und lineare operatoren. Matem. sb., 4 (46) (1938), 235-[illegible].
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zur theorie der charaktere der abelschen topologischen gruppen. Mater. sb. 9 (51), (1941), 49-50.
sur le theoreme de P. Picard. C.r. Acad. Sci., 18 (1929), 1536-1539.
neprivodimyye unitarnyye predstavleniya lokal'no bikompaktnykh grupp. DAN, 42 (1944), 203-205.
Abstrakte funktionen and lineare operatoren. Matem. sb., 4 (46) (1938), 235-286.
Dopolnitel'nyye i vyrozhdennyye serii predstavleniy kompleksnoy unimodulyarnoy gruppy. DAN, 58 (1947), 1577-1580.

GELFAND, I. M.

"Irreducible Unitary Representations of Locally Bi-compact Groups," Dok. AN, 42, No. 5, 1943. Steklofff Math. Inst. Mbr. Acad. Of Sci. c1943

GELFAND, I. M.

Gelfand, I. M., and Neumark, M. A. On unitary representations of the complex unimodular group. C. R. (Doklady) Acad. Sci. URSS (N.S.) 54, 195-198 (1946).

The authors announce a solution of the problem of determining all irreducible unitary representations of the complex unimodular group G, these representations being realized as operators in the space of functions of cosets with respect to certain subgroups of G. The present note describes (without proofs) certain coset spaces and the invariant measures on them. The subgroups of G which are considered are (1) unimodular matrices with zero everywhere below the main diagonal (upper triangular); (2) upper triangular matrices with main diagonal elements all unity; (3) lower triangular unimodular matrices; (4) lower triangular matrices with main diagonal elements all unity; (5) diagonal unimodular matrices. Both one-sided and two-sided cosets of these subgroups are considered. Proofs and more complete statement of the results are promised for later papers.

R. M. Thrall (Ann Arbor, Mich.).

Source: Mathematical Reviews, Vol 8 No. 8 .

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Gel'fand, I. M., and Naimark, M. A. Unitary representations of the Lorentz group. Izvestiya Akad. Nauk SSSR. Ser. Mat. 11, 411–504 (1947). (Russian)

Basic results in harmonic analysis are extended from the case of locally compact Abelian and compact groups to the case of the complex unimodular group G in two dimensions (i.e., the multiplicative group of 2×2 complex matrices of determinant 1; the quotient of this simply connected group modulo its two-element center is the Lorentz group), and the (strongly) continuous irreducible unitary representations of G on Hilbert spaces are explicitly determined. In particular, analogues of the Plancherel and Stone theorems concerning the additive group of the reals are formulated and proved for G; and by virtue of the mutual correspondence between unitary representations of and positive definite functions on a group [same authors, Rec. Math. [Mat. Sbornik] N.S. 12(54), 197–213 (1943); these Rev. 5, 147], the latter analogue implies an analogue to the Herglotz-Bochner theorem. The group G is the (only within local isomorphism) noncompact complex semi-simple Lie group of lowest dimension and it is stated that the methods of the present paper can be applied to arbitrary complex semi-simple Lie groups [cf. the authors, Mat. Sbornik N.S. 21(63), 405–434 (1947); these Rev. 9, 328]. Many of the proofs are along classical lines, much use being made of the Plancherel theorem, approximation by smooth functions on the group and related manifolds, and of bounds for norms of smooth functions by integrals involving transforms of the functions. The continuous irreducible unitary representations of G have also been found by Harish-Chandra [Proc. Roy. Soc. London. Ser. A. 189, 372–401 (1947); these Rev. 9, 132] in infinitesimal form, and by Bargmann [cf. Ann. of Math. (2) 48, 568–640 (1947); these Rev. 9, 133] in the same form as in the present paper, though by infinitesimal methods (i.e., the study of the representations of the Lie algebra of G), which are very different from those employed by the present authors; that the set of representations obtained constitutes all such representations is, however, proved completely, for the first time, in the present paper.

The continuous irreducible unitary representations of G fall into two distinct classes, designated as the principal and the complementary series, the first of which consists of those irreducible representations which are "contained in" the regular representation of G on $L_2(G)$ (where $L_p(X)$ de

Source: Mathematical Reviews, 1/2 Vol 9 No. 9

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GEL'FAND, I. M.

...s the space of pth power integrable functions relative [to] the invariant measure on X). To obtain the principal [se]ries, G is represented in the natural fashion on $L_2(G/H)$, [w]here H is the subgroup of G consisting of the matrices in G which have zero in the lower left corner, and the G-invariant measure on the coset space G/H is used. The resulting representation is then decomposed into a direct integral of irreducible representations.

First a matrix factorization theorem is used to regard elements f of $L_2(G/H)$ as functions of a complex variable z and a variable which ranges over the maximal Abelian subgroup D of diagonal matrices in G. Then essentially the Fourier transform of f as a function on D is taken, thereby arriving at a function $F_\chi(z)$, where χ varies over the character group D^* of D. Next it is observed that under the action of an element a of G, f maps into a function f' in such a way that f_χ' depends only on f_χ and a. Finally, for each fixed χ the transformation from f_χ to f_χ' determines a representation of G which, with an appropriate measure on the complex plane, is unitary on the corresponding L_2, and continuous and irreducible; these are the representations of the principal series. Two elements χ_1 and χ_2 of D^* correspond to unitarily equivalent representations if and only if either $\chi_1=\chi_2$ or $\chi_1=\chi_2^{-1}$; or more significantly, if and only if there is an inner automorphism of G which leaves D fixed, and such that the automorphism thereby induced on D^* takes χ_1 into χ_2. Thus to each point of the space E obtained from D^* by identifying inverse elements there corresponds a unique unitary-equivalence class of representations in the principal series. In a somewhat similar fashion the complementary series is obtained. All the continuous irreducible unitary representations of G are obtained from point transformations on the complex plane, a fact which permits the formation of a very concrete type of direct integral of such representations.

For any continuous irreducible unitary representation U of G, the operator $\int_G U(a)f(a)da$, da being the element of Haar measure, is in the Hilbert-Schmidt class when f is continuous and vanishes outside a compact set, and completely continuous when $f \in L_1(G)$. All suc[h] representations (except the trivial one) are infinite-dime[n]sional, so that $U(a)$ will never be in the Hilbert-Schm[idt] class, but a formal trace $\tau(a)$ can be defined such [that] $\mathrm{tr}\,(\int_G U(a)f(a)da) = \int_G \tau(a)f(a)da$ for f continuous and

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ishing outside a compact set, so that there is an analogue for the characters of irreducible representations of Abelian and compact groups. The analogue to Plancherel's theorem can be stated as follows, for simplicity not in most general form: if $f \in L_1(G) \cap L_2(G)$, then $\int_G |f(a)|^2 da = \int_E \operatorname{tr}(F_e^* F_e) d\mu(e)$, where $F_e = \int U(a) f(a) da$, U being a representation in the unitary-equivalence class e (F_e is a generalization of the Fourier transform), μ is a certain measure on E, and the asterisk denotes the adjoint. In a more refined form the analogue to Plancherel's theorem assigns to every element $f \in L_1(G)$ a function $K(z_1, z_2, e)$ on $S = C \times C \times E$, C being the complex plane, which is the kernel in a representation of F_e as an integral operator, and asserts that, for a certain measure on S, the mapping $f \to K$ is isometric and onto from $L_2(G)$ to $L_2(S)$. Another form of essentially the same theorem is the result that the regular representation of G is a direct integral relative to a stated measure of the representations in the principal series.

Finally it is shown that every continuous unitary representation of G is a direct integral of representations of the principal and complementary series. A continuous unitary representation of G gives rise to positive definite functions on G which give rise to linear functionals on $L_1(G)$ which are positive, in the sense of being nonnegative on the convolution of an element of $L_1(G)$ with its adjoint. It is sufficient in the present case to consider a certain commutative subalgebra of $L_1(G)$ which is isomorphic to an algebra of smooth functions of a complex variable, relative to a convolution-type product. The elementary positive linear functions on this algebra, i.e., those which are not linear combinations with positive coefficients of two other positive linear functions, are determined explicitly, and it is shown that every positive linear function is an integral, relative to a measure on the space of elementary functions, of the elementary functions. From this the above decomposition theorem for representations follows.

I. E. Segal.

Source: Mathematical Reviews, 3/3 Vol 9 No. 9

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Gelfand, I. M.

Gelfand, I., and Neumark, M. Unitary representations of the group of linear transformations of the straight line. C. R. (Doklady) Acad. Sci. URSS (N.S.) 55, 567–570 (1947).

If R is the group of real linear transformations $y = \alpha x + \beta$, $-\infty < \beta < \infty$, $0 < \alpha < \infty$, then it contains the subgroup T of translations $x \to x + \beta$ and the subgroup S of dilations $x \to \alpha x$, both commutative, such that $T \cdot S = R$. The group R possesses the family of one-dimensional representations, which are independent of β, of the group $y \to y + \log \alpha$ on the straight line, and no other almost periodic representations. As for irreducible unitary representations in countably-dimensional Hilbert space the following is the only one. Let H be the Hilbert space of functions $f(x)$ in $L_2(-\infty, \infty)$ whose Plancherel transform vanishes in $-\infty < \alpha < 0$, or alternatively in $0 < \alpha < \infty$. Then $x \to x + \beta$ corresponds to $f(x) \to f(x - \beta)$ and $x \to \alpha x$ corresponds to $f(x) \to \alpha^{\frac{1}{2}} f(\alpha x)$. The proof is based on the Hellinger-Hahn decomposition of H corresponding to a resolution of the identity; it is applied to the resolution of the identity $E(\lambda)$ occurring in

$$T_\beta f = \int_{-\infty}^{\infty} e^{i\lambda\beta} dE(\lambda) f,$$

by Stone's theorem for the subgroup T of R.

S. Bochner (Princeton, N. J.).

Mathematical Reviews, Vol 8 No. 10

GELFAND, I. M.

Gelfand, I., and Neumark, M. The principal series of
irreducible representations of the complex unimodular
group. C. R. (Doklady) Acad. Sci. URSS (N.S.) 56, 3-4
(1947).

For noncompact groups in general, and the complex
unimodular group G in particular, not every irreducible
representation occurs as a constituent of the regular repre-
sentation. The authors define the quasi-regular representa-
tion of a group as the direct sum of all of the distinct
irreducible representations (each with multiplicity one)
which appear in the regular representation. The main result
of the present note is a characterization of the space for the
quasi-regular representation as the Hilbert space of all
square summable functions on the subgroup H consisting
of all elements of G which considered as matrices have zeros
below the main diagonal.

R. M. Thrall

Gel'fand, I. M.

Gel'fand, I. M., and Naimark, M. A. Supplementary and degenerate series of representations of the complex unimodular group. Doklady Akad. Nauk SSSR (N.S.) 58, 1577–1580 (1947). (Russian)

Les auteurs généralisent d'abord la notion de série fondamentale de représentations unitaires du groupe unimodulaire. En conservant les notations du mémoire revu ci-dessus, on définit alors les sous-groupes k comme il suit. Soient $n_1, \cdots, n_r$ des nombres naturels, $n_1 + \cdots + n_r = n$ (si c'est le groupe unimodulaire de n variables qu'il faut représenter). Alors les g_{pq} ne sont pas les éléments du matrice $\|g_{pq}\|$, mais eux-mêmes des matrices de n_p lignes et n_q colonnes, et K est alors le groupe des matrices pour lesquelles la matrice $K_{pq}=0$ pour $p>q$ et $\prod \det (k_{pp}) = 1$. A cette généralisation près, toutes les définitions et notations sont des répétitions verbales de celles du mémoire cité. Les séries de représentations nouvelles sont appelées dégénérées; elles consistent toujours de représentations irréductibles. A part de celles-ci on trouve des séries supplémentaires. Soient $n_1 = n_2 = \cdots = n_{2r} = 1$ $(r \geqq 1)$. Alors Z' est l'ensemble des éléments z' de Z, qui ont $z_{2j,2j-1} \neq 0$ pour $0 \leqq j \leqq r$ et $z_{pq}=0$ ailleurs; Σ est l'ensemble des paires [illegible]. Le groupe transforme Σ d'après la loi [illegible]

Alors des définitions tout à fait analogues à celles du mémoire précédent conduisent à des représentations irréductibles constituant la série supplémentaire (non dégénérée pour $r=n$, dégénérée dans les autres cas). La note présente ne contient pas de démonstrations.

H. Freudenthal.

Source: Mathematical Reviews, Vol 7 No. 7

GEL'FAND, I. M.

Gel'fand, I. M., and Yaglom, A. M. General Lorentz invariant equations and infinite-dimensional representations of the Lorentz group. Akad. Nauk SSSR. Zhurnal Eksper. Teoret. Fiz. 18, 703-733 (1948). (Russian)

[A short account of this paper's main results was published in Doklady Akad. Nauk SSSR (N.S.) 59, 655-658 (1948); these Rev. 9, 496.] The authors investigate Lorentz invariant equations of the form

(1) $L^k \partial\psi/\partial x^k + i\kappa\psi = 0, \qquad k = 0, \cdots, 3.$

Here the wave function $\psi(x^0, x^1, x^2, x^3)$ has a finite or an infinite number of components (i.e., it is a vector in a finite- or an infinite-dimensional vector space R), L^k are linear operators on R, and κ is a nonvanishing real constant. To every Lorentz transformation $x^i \to x'^i = l^i_k x^k$ corresponds a transformation $\psi \to \psi' = S\psi$ such that the S form a representation D_R of the Lorentz group on R. Then (1) is Lorentz invariant if, for every Lorentz transformation, (2) $L^i = l^i_k S L^k S^{-1}$. The authors are mainly concerned with the construction of all systems (L^i) satisfying the relations (2). Their analysis is based on the infinitesimal relations which follow from (2). Let $x^i \to x'^i = x^i + \epsilon^i_k x^k = x^i + g^{ij}\epsilon_{jk} x^k$ be an infinitesimal Lorentz transformation ($g^{00} = -g^{11} = -g^{22} = -g^{33} = 1$, $g^{ij} = 0$ $(i \neq j)$; $\epsilon_{ij} = -\epsilon_{ji}$). Then $\psi \to \psi' + \frac{1}{2}\epsilon_{ik} I^{ik}\psi$ $(I^{ik} = -I^{ki})$, where the I are the infinitesimal generators of the representation D and satisfy the well-known commutation [illegible] infinitesimal Lorentz transformations. The relations [illegible] imply

(3) $[L^i, I^{jk}] = g^{ij}L^k - g^{ik}L^j, \qquad i, j, k = [illegible]$

where $[A, B]$ denotes the commutator $AB - BA$. [illegible] relations are sufficient to insure (2) if only proper Lorentz transformations are considered while spatial reflections must be treated separately. It is easily shown that the solution of (3) reduces to the solution of the following system:

(4) $[L^0, I^{jk}] = 0 \; (j, k = 1, 2, 3); \quad [[L^0, I^{0m}], I^{0m}] = L^0,$

the remaining operators being defined by $L^k = [L^0, I^{0k}]$ $(k = 1, 2, 3)$. The finite-dimensional case has been treated by various writers [cf. the note cited above]. The authors are therefore mainly interested in the infinite-dimensional case. Their methods, however, cover both cases.

For the solution of (4) the form of the infinitesimal operators I^{ik} must be known. It is assumed that the representation D_R may be decomposed into a finite or at most countably infinite number of irreducible representations of the Lorentz group. The irreducible representations (both finite- and infinite-dimensional) may be characterized by a pair of numbers (k_0, l_1), where k_0 is integral or half integral,

Source: Mathematical Reviews, Vol No.

and k_1 an arbitrary complex number. (The two pairs (k_0, k_1) and $(-k_0, -k_1)$ lead to equivalent representations.) The representation space $R_{(k_0, k_1)}$ may be decomposed into $(2k+1)$-dimensional subspaces invariant under spatial rotations and spanned by vectors ξ_p^k (k integral or half integral; $p = -k, -k+1, \cdots, k-1, k$). In general, k assumes the values $|k_0|, |k_0|+1, |k_0|+2, \cdots$, so that $R_{(k_0, k_1)}$ is infinite-dimensional. If $2k_1$ is integral, has the same parity as $2k_0$, and if $|k_1| > |k_0|$, then $R_{(k_0, k_1)}$ is finite-dimensional, and k assumes the values $|k_0|, |k_0|+1, \cdots, |k_1|-1$. (This corresponds, in usual notation, to the representation $D_{jj'}$, where $j = \frac{1}{2}(k_0+k_1)$, $j' = \frac{1}{2}(k_0-k_1)$.) All unitary representations of the proper Lorentz group are obtained either by letting k_1 be purely imaginary, or by choosing $k_0 = 0$ and k_1 real such that $0 < |k_1| < 1$. For a given pair (k_0, k_1), the infinitesimal generators of the corresponding irreducible representation are determined by

$$I^{12}\xi_p^k = ip\xi_p^k, \quad (I^{23}+iI^{13})\xi_p^k = \{(k+p)(k-p+1)\}^{\frac{1}{2}}\xi_{p-1}^k,$$

$$(I^{23}-iI^{13})\xi_p^k = -\{(k+p+1)(k-p)\}^{\frac{1}{2}}\xi_{p+1}^k;$$

$$2I^{03}\xi_p^k = -\{(k+p)(k-p)\}^{\frac{1}{2}}B_k\xi_p^{k-1} + pA_k\xi_p^k + \{(k+p+1)(k-p+1)\}^{\frac{1}{2}}B_{k+1}\xi_p^{k+1},$$

with $A_k = 2k_0k_1/k(k+1)$, $B_k = \{(k^2-k_0^2)(k^2-k_1^2)/k^2(k^2-\frac{1}{4})\}^{\frac{1}{2}}$. (The sign of B_k may be chosen arbitrarily.)

The form of the operator L^0 [cf. (4)] is determined in a straightforward way. Denote by $R_\tau = R_{(k_0, k_1)}$ the irreducible subspaces of R invariant under the transformations S, and by $\xi_{\tau p}^k$ the vectors which span R_τ. The authors find that (1) $L^0\xi_{\tau p}^k = \sum c_{\tau'\tau}^k \xi_{\tau' p}^k$, (2) $c_{\tau'\tau}^k$ can be different from zero only if the pair (k_0', k_1') is equivalent to (k_0+1, k_1), (k_0-1, k_1), (k_0, k_1+1), or (k_0, k_1-1) (if $\tau \sim (k_0, k_1)$, and $\tau' \sim (k_0', k_1')$), (3) the coefficients $c_{\tau'\tau}^k$ are uniquely determined by constants $c_{\tau'\tau}$ which may be arbitrarily chosen (for example, the authors obtain $c_{\tau'\tau}^k = c_{\tau'\tau}\{(k+k_0+1)(k-k_0)\}^{\frac{1}{2}}$ if $k_0' = k_0+1$, $k_1' = k_1$, and similar expressions in the remaining cases). If

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[illegible]

Source: Mathematical Reviews, Vol 10 No. 8

GEL'FAND, I. M.

Gel'fand, I. M., and Yaglom, A. M. On Lorentz invariant equations to which correspond a definite charge and a definite energy. Doklady Akad. Nauk SSSR (N.S.) 63, 371–374 (1948). (Russian)

Gel'fand, I. M., and Yaglom, A. M. Pauli's theorem for general Lorentz invariant equations. Akad. Nauk SSSR. Zhurnal Eksper. Teoret. Fiz. 18, 1096–1104 (1948). (Russian)

The first of these two papers merely gives the main results; the second contains the detailed proofs. W. Pauli [Physical Rev. (2) 58, 716–722 (1940)] has proved the following theorem concerning Lorentz invariant equations for wave functions with a finite number of components. For integral spin values neither the charge density nor the total charge of the system described may be (positive or negative) definite, for half integral spin values neither the energy density nor the total energy may be definite, provided the wave equations are differential equations and the expressions for charge and energy density are obtained by differential operations. The authors generalize this theorem to wave functions with an infinite number of components which satisfy the equations studied in a previous paper, more specifically, those equations which are derived from an invariant Lagrangian [cf. the preceding review, to which the reader is referred for details]. Charge and energy density are given by s^0 and T_0^0, respectively [cf. equations (8) and (9) of the preceding review]. By discussing the irreducible representations $\tau \sim (k_0, k_1)$ (where $k_1 = k_1' + ik_1''$) which occur in D_E, the authors establish the following results (in any one of the following statements charge (energy) may be interpreted as either charge (energy) density or total charge (energy)). (A) If, for some τ, $k_1'' \neq 0$, and $2k_1'$ is not integral, neither charge nor energy is definite. (B) If, for some τ, $k_1'' \neq 0$, the charge is indefinite for an integral k_1', and the energy is indefinite for a half integral k_1'. (C) If, for some τ, k_1 is real, but $2k_1$ is not integral, the charge is indefinite for an integral k_0, and the energy is indefinite for a half integral k_0. (D) If, for some τ, both k_0 and k_1 are integral, the charge is indefinite; if both k_0 and k_1 are half integral, the energy is indefinite. There remains the possibility that of the two numbers k_0, k_1 one is integral and the other half integral, as in the two cases (I) and (II) [cf. the preceding review]. The authors assert that in these two cases both charge and energy density are definite. [Reviewer's note. While the assertion concerning the charge density is correct, one can construct solutions with both positive and negative energy densities or total energies. The authors base their proof on the decomposition of the general solution of the wave equation into plane waves with time-like wave vectors; the wave equation, however, also admits plane wave solutions whose wave vectors are space-like or null vectors.]

V. Bargmann (Princeton, N. J.)

Source: Mathematical Reviews, Vol 10 No. 8

GEL'FAND, I. M.

Gel'fand, I. M., and Yaglom, A. M. Charge conjugation for general Lorentz invariant equations. Akad. Nauk SSSR. Zhurnal Eksper. Teoret. Fiz. 18, 1105–1111 (1948). (Russian)

This paper deals with the applicability of the method of charge conjugation [developed for Dirac's equation by E. Majorana, Nuovo Cimento (N.S.) 14, 171–184 (1937); and H. A. Kramers, Nederl. Akad. Wetensch., Proc. 40, 814–823 (1937)] to the general Lorentz invariant equations studied by the authors in a previous paper [see the second preceding review]. In the absence of an electromagnetic field the equations read $L^k\partial\psi/\partial x^k + i\kappa\psi = 0$, where ψ is a vector with a finite or an infinite number of components and κ is a real constant. For an external electromagnetic field given by the four-vector potential φ_k the authors set

(*) $$L^k(\partial\psi/\partial x^k - i\epsilon\varphi_k\psi) + i\kappa\psi = 0.$$

The charge conjugate wave function ψ^Q is defined by an antilinear transformation $\psi^Q = Q\psi$ (i.e., $Q(\psi_1+\psi_2) = Q\psi_1 + Q\psi_2$, and $Q(\lambda\psi) = \lambda^* Q\psi$), and it is assumed that (a) ψ^Q satisfies the equation (*) with ϵ replaced by $(-\epsilon)$, and (b) $(\psi^Q)' = (\psi')^Q$, where $\psi' = S\psi$ is the Lorentz transformed wave function. (The condition (b) expresses the Lorentz invariance of chargeconjugation.) The condition (a) implies $QL^k + L^kQ = 0$, while (b) implies $SQ = QS$. Using the results reviewed above, the authors determine the possible forms of Q. It is found (1) that the operator Q cannot always be defined, since the constants $c_{\tau\tau'}$ of the previous paper must satisfy certain additional conditions, (2) that Q (if it can be defined at all) is (up to a factor) uniquely determined if the equation (*) is irreducible. *V. Bargmann* (Princeton, N. J.).

Source: Mathematical Reviews, Vol 10 No. 8

SMW

GEL'FAND, I. M.

Gel'fand, I. M., and Naimark, M. A. The trace in fundamental and supplementary series of representations of the complex unimodular group. Doklady Akad. Nauk SSSR (N.S.) 61, 9-11 (1948). (Russian)

[Pour les notations voir Mat. Sbornik N.S. 21(63), 405–434 (1947); Doklady Akad. Nauk SSSR (N.S.) 58, 1577–1580 (1947); ces Rev. 9, 328, 329; remplacer sur p. 329, première colonne, ligne 16 d'en bas la lettre k par K.] Les auteurs s'occupent des traces des représentations unitaires du groupe complexe unimodulaire. Ces traces sont regardées comme des fonctionnelles définies dans l'anneau de groupe (c'est-à-dire dans l'anneau des fonctions sommables, où le produit est la convolution de deux fonctions). Si U_g est une représentation de la série non-dégénérée et $x(g)$ est un élément de l'anneaux de groupe, la transformation $U_x f(z) = \int x(g) U_g f(z) d\mu(g)$ possède un noyeau intégral dont la trace est

$$\int x(g) \frac{\sum \chi(k_s)}{D(g)} d\mu(g)$$

où la somme s'étend [comme celle qui a été citée en ces Rev. 9, 328, deuxième colonne, dernière formule] sur toutes les permutations des valeurs propres de g sur la diagonale principale de g, et où $D(g)$ est les discriminant de l'équation caractéristique de g. Pour les séries dégénérés la formule est analogue, mais plus compliquée. On donne des critères nécessaires et suffisants pour l'équivalence de deux représentations. *H. Freudenthal* (Utrecht).

GELFAND, I.M.

Gel'fand, I. M., and Naimark, M. A. On the connection between the representations of a complex semi-simple Lie group and those of its maximal compact subgroups. Doklady Akad. Nauk SSSR (N.S.) 63, 225–228 (1948). (Russian)

The "nondegenerate" continuous (in the strong topology) irreducible unitary representations on Hilbert spaces of complex semi-simple Lie groups (especially of the complex unimodular group), and their contractions to maximal compact subgroups, are described in concise terms, in continuation of earlier work by the same authors [Mat. Sbornik N.S. 21(63), 405–434 (1947); Izvestiya Akad. Nauk SSSR. Ser. Mat. 11, 411–504 (1947); these Rev. 9, 328, 495]. Any such representation $a \to T_a$ of the group G has as a representation space a Hilbert space of all square-integrable functions, relative to a measure depending on the representation (though simply the unique invariant measure for the representations in the principal series), over the right coset space U/Γ, where U is a maximal compact subgroup of G and $\Gamma = U \cap D$, D being a maximal Abelian subgroup of G generated by a regular element. Each coset of U modulo Γ is contained in exactly one right coset of G modulo K, where K is the subgroup of G generated by the positive roots of its Lie algebra. The functions f on U/Γ can thereby be identified with those functions $\bar{f}$ on G/K which have the property $\bar{f}(\gamma u) = \bar{f}(u)$, $\gamma \epsilon \Gamma$, and the integral of f over U/Γ is the same as the integral of $\bar{f}$ over G/K (relative to the respective invariant measures). The representation T can be most conveniently described by its action on the Γ-invariant functions f over G/K, and has then the form $(T_a f)(x) = \alpha(xa)(\alpha(x))^{-1} f(xa)$, where α is a function determined (via a way of factoring the elements of G) by a character χ of D (of absolute value one for the principal series and not necessarily bounded for the complementary series), and is uniquely determined by the equivalence class of the representation within multiplication by a function of absolute value one. In case G is the complex unimodular group, U can be taken as the unitary elements, D as the diagonal elements, and K as those elements which are zero below the diagonal.

A necessary and sufficient condition that T have in its representation space a nonzero vector x invariant under the T_a, $a \epsilon U$, is that χ be trivial on Γ; if x exists, it is unique within multiplication by nonzero numbers, and $(T_a x, x)$ is a positive definite function on G which is invariant under two-sided translations by elements of U. This function is called the spherical function of the given representation and

Source: Mathematical Reviews, Vol 10 No. 5

an explicit formula is given for it, in terms of χ. A necessary and sufficient condition that the contraction of T to U contain a given continuous irreducible unitary representation S of U is that the representation space of S contain a weight vector for the contraction of χ to Γ; and the maximum number of linearly independent weight vectors is the same as the number of times S is contained in T. In particular, the representation of U corresponding to the lowest dominant weight occurs only once, and that weight is the contraction of χ to Γ. *I. E. Segal* (Chicago, Ill.).

GELFAND, I. M.

Gel'fand, I. M., and Naimark, M. A. The analogue of Plancherel's formula for the complex unimodular group. Doklady Akad. Nauk SSSR (N.S.) 63, 609-612 (1948). (Russian)

An analogue of Plancherel's formula is obtained for functions on the complex unimodular group G_n in n dimensions, $n \geqq 3$. The analogue for the case $n=2$ was established by the same authors in an earlier paper [Izvestiya Akad. Nauk SSSR. Ser. Math. 11, 411-504 (1947); these Rev. 9, 495] and the formula for $n \geqq 3$ is similar in general character to that for the case $n=2$. However, a new circumstance arises in the case $n \geqq 3$ in the existence of a new type of family among the "supplementary" irreducible representations of the group, called the "degenerate" representations ("supplementary" means that the representation is not contained in the regular representation of the group). The result is as follows, in the notation used by the authors in their determination of the representations in the "fundamental" series of G_n (an irreducible representation is in this series if it is contained in the regular representation) [Mat. Sbornik N.S. 21(63), 405-434 (1947); these Rev. 9, 328]: if x is a square integrable function on G_n, $n \geqq 3$, then

$$\int |x(g)|^2 d\mu(g) = (n!)^{-1}(2\pi)^{-(n-1)(n+1)} \times \sum_{m_1,\cdots,m_n=-\infty}^{\infty} \int_{-\infty}^{\infty} \cdots \int \left[\int |K(z', z'', \chi)|^2 d\mu(z') d\mu(z'') \right] \times \alpha(\chi) d\rho_2 \cdots d\rho_n,$$

where

$$K(z', z'', \chi) = \int x(z'^{-1} \delta z'') \beta^{-\frac{1}{2}}(\delta) \chi(\delta) d\mu(\delta) d\mu(\zeta),$$

$$\alpha(\chi) = \prod_{1 \leq p < q \leq n} [(n_p - n_q)^2 + (\rho_p - \rho_q)^2], \quad n_1 = \rho_1 = 0.$$

The integral defining K is convergent (in mean) relative to the norm defined by the square root of the right side of the formula.

In case $x \epsilon L_1(G)$, then $K(z', z'', \chi)$ is the kernel of the completely continuous operator $T = \int U_{\chi, g} x(g) d\mu(g)$, regarded as an operator on functions of z', and the trace of T^*T is equal to the left side of the formula. The proof is sketched for the case $n=3$, much use being made of factorizations for elements of G_n and of a number of auxiliary functions.

I. E. Segal (Chicago, Ill.).

Source: Mathematical Reviews, Vol 10 No. 7

GEL'FAND, I.M.; NAYMARK, M.A.

[Unitary representations of classical groups] Unitarnye predstavleniia klassicheskikh grupp. Moskva, Izd-vo Akademii nauk SSSR, 1950. 288 p. (Akademiia nauk, Leningrad. Matematicheskii institut imeni V.A.Steklova. Trudy. 36) (MLRA 7:6)
(Groups, Theory of)

Gel'fand, I.M

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Gel'fand, I. M., and Cetlin, M. L. Finite-dimensional representations of groups of orthogonal matrices. Doklady Akad. Nauk SSSR (N.S.) 71, 1017-1020 (1950). (Russian)

The authors give explicit formulas for the irreducible finite-dimensional representations of the Lie algebra of all skew-symmetric matrices of a given finite order, apparently in continuation of their similar work on the unimodular group. As the foregoing Lie algebra is that of the orthogonal group, the irreducible finite-dimensional representations of these groups are thereby determined. Actually, relatively explicit formulas for these representations are classical.

I. E. Segal (Chicago, Ill.).

Source: Mathematical Reviews, Vol 11 No. 9

Co-author: Tsetlin, M. L.

GEL'FAND, I. M.

Gel'fand, I. M. Expansion in characteristic functions of an equation with periodic coefficients. Doklady Akad. Nauk SSSR (N.S.) 73, 1117-1120 (1950). (Russian)

It is shown that the eigenfunctions of an elliptic differential operator of second order with continuous periodic coefficients, on Euclidean n-space, span the (Hilbert) space of square-integrable periodic functions. While this is classical for the case $n=1$, the present proof is apparently simpler and more elementary than other existing proofs. This proof uses a method similar to that employed by A. Weil in his proof of the Plancherel theorem for locally compact Abelian groups [L'intégration dans les groupes topologiques et ses applications, Actualités Sci. Ind., no. 869, Hermann, Paris, 1940; these Rev. 3, 198], and in the case $n>1$ (in which case the proof is merely sketched) the existence of a Green's function for the given elliptic operator. *I. E. Segal.*

Source: Mathematical Reviews. Vol 12 No. 7

GEL'FAND I. M.

USSR/Mathematics - Differential Equations 11 Oct 50
Boundedness

"Boundedness of Solutions of the Equation $y'' + p(t)y = 0$, $p(t + k) = p(t)$," V. A. Yakubovich

"Dok Ak Nauk SSSR" Vol LXXIV, No 5, pp 901-905

Derives 3 boundedness criteria for soln of arbitrary system of 2d order with continuous periodic coeff. Work based on idea advanced by I. M. Gel'fand at seminar in Moscow State U in winter 1948. Submitted by Acad A. N. Kolmogorov 4 Jul 50.

[redacted] 172T38

Gelfand, I.M.

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*Gel'fand, I. M. Lekcii po lineinoi algebre. [Lectures on Linear Algebra]. 2d ed. Gosudarstv. Izdat. Tehn.-Teor. Lit., Moscow-Leningrad, 1951. 252 pp.

This book covers the standard topics in linear algebra. The most noteworthy feature is the insertion of two appendices on computational methods. The headings are as follows. I. n-dimensional spaces. Linear and bilinear forms. II. Linear transformations. III. Canonical form of a linear transformation. IV. The concept of tensor. Appendix I. Methods of computation in linear algebra. II. The theory of perturbation.

I. Kaplansky (Chicago, Ill.).

Source: Mathematical Reviews, Vol 13 No 2

GEL'FAND, I. M.

"Generalized Functions and Their Application to Analysis," lecture reported in Uspekh. Matemat Nauk, 6, No. 4, 1951. -*

* 7 Sessions Moscow Math. Soc. 13 Mar-8 May 51.

GEL'FAND, I.M.

Gel'fand, I. M., and Levitan, B. M. **On the determination of a differential equation from its spectral function.** Izvestiya Akad. Nauk SSSR. Ser. Mat. 15, 309–360 (1951). (Russian)

This is a detailed account of the results sketched in an article of the same title [Doklady Akad. Nauk SSSR (N.S.) 77, 557–560 (1951); these Rev. 13, 240]. In the notation of the earlier review let the monotone function $\rho(\lambda)=2(\lambda/\pi)^{\frac{1}{2}}+\sigma(\lambda)$ for $\lambda\geqq 0$ and $\rho=\sigma(\lambda)$ for $\lambda<0$. Let $\int_{-\infty}^{0}\exp(|\lambda|^{\frac{1}{2}}x)d\rho(\lambda)$ exist for all $x>0$ and let $a(x)=\int_1^\infty\lambda^{-1}\cos(\lambda)^{\frac{1}{2}}xd\sigma(\lambda)$ be of class C_4. Then there exists a continuous function $q(x)$ and a constant h such that $\rho(\lambda)$ is the spectral function for $y''+(\lambda-q(x))y=0$, $0\leqq x<\infty$, $y(0,\lambda)=1$, $y'(0,\lambda)=h$. The relationship (*) $\phi(x,\lambda)=\cos(\lambda^{\frac{1}{2}}x)+\int_0^x K(x,t)\cos(\lambda^{\frac{1}{2}}t)dt$ plays a fundamental role. The problem on the finite interval is also considered. [Remark. The proof that $y=\phi(x,\lambda)$ defined by (*) satisfies the differential equation can be shortened considerably by proceeding as follows. The function $K(x,y)$ in (*) is determined by

$$I=K(x,y)+f(x,y)+\int_0^x K(x,t)f(t,y)dt=0$$

where $f(x,y)=a(x+y)+a(x-y)$ for some $a(x)$ of class C_2. Take the partial derivatives I_{xx} and I_{yy} and reformulate I_{yy} by use of integration by parts. Consider now $I_{xx}-I_{yy}-q(x)I=0$. This turns out to be

$$J(x,y)+\int_0^x J(x,t)f(t,y)dt+[2dK(x,x)/dx-q(x)]f(x,y)=0$$

where $J(x,y)=K_{xx}-K_{yy}-q(x)K$ and where account has been taken of the fact that $K_y(x,0)=0$. If $q(x)$ is taken as $2dK(x,x)/dx$ then the integral equation for J becomes homogeneous and therefore has only the null solution. Thus $J=0$ and K satisfies $K_{xx}-K_{yy}-q(x)K=0$. Direct calculation now shows $y=\phi(x,\lambda)$ satisfies the differential equation (and also appropriate initial conditions).]

N. Levinson.

Source: Mathematical Reviews, Vol 13 No. 6

GEL'FAND, I.M.

Gel'fand, I. M., and Fomin, S. V. Unitary representations of Lie groups and geodesic flows on surfaces of constant negative curvature. Doklady Akad. Nauk SSSR (N.S.) 76, 771–774 (1951). (Russian)

The authors consider the spectrum of a geodesic flow on a surface of constant negative curvature. They show that this spectrum in the case of a 2-dimensional surface is a Lebesgue spectrum (i.e. the spectral measures are all equivalent to the ordinary Lebesgue measure). In case the surface is compact they show that the spectrum is an enumerably multiple Lebesgue spectrum. The well known theorems of Hopf and Hedlund [cf. e.g. E. Hopf, Ber. Verh. Sächs. Akad. Wiss. Leipzig 91, 261–304 (1939); these Rev. 1, 243] on the metric transitivity and mixing properties of geodesic flows on surfaces of constant negative curvature follow as corollaries.

The method used to show that the spectrum is a Lebesgue spectrum is to represent the geodesic flow as a flow defined on the co-set space G/N of the group G of real matrices of order 2 with determinant 1 modulo a suitable discrete subgroup N. The flow S_t is defined by means of multiplication by $\begin{pmatrix} e^{-t} & 0 \\ 0 & e^{t} \end{pmatrix}$. The authors then appeal to the classification of irreducible unitary representations of the group G [illegible] Gel'fand and M. A. Naĭmark, Izvestiya Akad. Nauk [illegible] Ser. Mat. 11, 411–504 (1947); these Rev. 9, 4[illegible] show that for each type of these representations [illegible] trum is a Lebesgue spectrum. Their result follows [illegible] consequence.

By similar methods one can compute the spectrum of a flow defined on the co-set space G/N of any locally compact Lie group G modulo a discrete subgroup N. The flow will be defined by a 1-parameter subgroup s_t of G provided the irreducible unitary representations of G are known. Modifying their method the authors deduce that the spectrum of a geodesic flow on a surface of constant negative curvature of arbitrary dimension is an absolutely continuous spectrum (i.e. the spectral measures are absolutely continuous set functions). Proofs are either omitted or only sketched.

Y. N. Dowker (Manchester).

Source: Mathematical Reviews, Vol 13 No.5

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GEL'FAND, I. M.

"Unitary Representations of a Unimodular Group Containing a Single Representation of a Unitary Subgroup," by I.M.Gel'fand and M. A. Naymark, Trudy Mosk., mat. ob., No. 1, 1952.

MIRA Nov 1952

GEL'FAND, I.M.

Gel'fand, I. M., and Šapiro, Z. Ya. Representations of the group of rotations in three-dimensional space and their applications. Uspehi Matem. Nauk (N.S.) 7, no. 1(47), 3–117 (1952). (Russian)

This is a clear, full, and elementary exposition of the representations of the 3-dimensional rotation group and their applications, together with some new material. Particular stress is laid on relations with quantum mechanics and with other parts of mathematics. However, the approach is explicit, computational, and practical, and invariant formulations and questions of general theory are kept correspondingly in the background. On the whole the treatment is distinctly more detailed and comprehensive than any in English and should be particularly valuable for workers in quantum mechanics and for those interested in a highly concrete introduction to the theory of representations of Lie groups. In addition to the usual material, including spherical harmonics, decomposition of product representations, spinors, and tensor representations, there are three sections containing some new material. These consist of: 1) explicit determination of the matrix elements of all the irreducible representations; 2) a study of the decomposition of vector and tensor fields under the action of the rotation group, with application to Maxwell's equations; 3) a study of equations invariant under the rotation group and of the Dirac equation in particular.

I. E. Segal.

GEL'FAND, I. M.

USSR/Mathematics - Geodesic Currents Jan/Feb 52

"Geodesics Currents on Manifolds of Constant Negative Curvature," I. M. Gel'fand, S. V. Fomin

"Uspekh Matemat Nauk" Vol VII, No 1 (47), pp 118-137

Investigates geodesic currents on manifolds of const neg curvature by employing the method of spectra of suitable systems rather than the theoretico-group method. Considers the interesting problem of establishing the multiplicity of the spectrum of geodesic currents. First studies the 2-dimensional case (geodesic currents on a surface) and later the general n-dimensional case.

204T27

USSR/Mathematics - Eigenvalues Nov/Dec 52

"Spectrum of Non-Selfadjoint Differential Equations," I. M. Gel'fand

"Usp Matemat Nauk" Vol 7, No 6 (52), pp 183-184

PA 243T84

Considers the spectrum of a non-selfadjoint differential operator given in an infinite region under the assumption that the equation is self-adjoint outside a certain finite region. Since the equation is non-selfadjoint, its spectrum does not have to be real. However, it will be shown that the equation's complex spectrum is

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discrete, that is, no single point of the spectrum, not lying on the real axis is the limit point for the points of the spectrum. Studies the equation $-\Delta u + p_1 u + p_2 u = \lambda u$.

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GEL'FAND, I. M.

GEL'FAND, I. M. and Grayev, M. I.

"Unitary Representations of Real Simple Lie Groups," Dok. AN SSSR, 86, No. 3, 1952

MLRA December 1952

GELFAND, I.M.

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Gel'fand, I. M., and Šilov, G. E. Fourier transforms of rapidly increasing functions and questions of uniqueness of the solution of Cauchy's problem. Uspehi Matem. Nauk (N.S.) 8, no. 6(58), 3-54 (1953). (Russian)

The methods employed by L. Schwartz in his Théorie des distributions [t. I, II, Hermann, Paris, 1950, 1951; these Rev. 12, 31, 833] are here extended to several new function-spaces and to the solution of certain problems in partial differential equations. The basic idea, which goes back to S. L. Sobolev [Mat. Sbornik N.S. 1(43), 39-72 (1936)], is to consider first a certain space Φ of "basic" (complex) functions, with a suitable topology. These functions are defined on R^N. A generalized function is then defined as a continuous linear functional T on Φ. The space of all such functionals is denoted by $T(\Phi)$. The functions in Φ are all infinitely differentiable and behave at infinity in such a way that the Fourier transform

$$\int_{R^N} \exp\{-2\pi i(s_1x_1+\cdots+s_Nx_N)\}\varphi(x)dx=\tilde{\varphi}(s)$$

is defined for all φ in Φ and is again an infinitely differentiable function with good behavior at infinity. $\tilde{\varphi}(s)$ may be defined for certain complex values $s=\{\sigma_1+it_1, \sigma_2+it_2, \cdots, \sigma_N+it_N\}$. (OVER)

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The set of all $\tilde{\varphi}$ is denoted by $\tilde{\Phi}$. For $T \varepsilon T(\Phi)$, the Fourier transform $\tilde{T}$ is defined as the generalized function on $\tilde{\Phi}$ such that $\tilde{T}(\tilde{\varphi}) = T(\varphi_-)$, where $\varphi_-(x) = \varphi(-x)$. For appropriate spaces Φ, every function f which is Lebesgue integrable on compact sets defines a continuous linear functional by $\varphi \rightarrow \int_{R^N} f(x)\varphi(x)dx$, and thus a Fourier transform (no longer necessarily a function) is defined for all such functions f, no matter how rapidly they increase as $|x| \rightarrow \infty$. Differentiation of generalized functions is defined by the usual formula $(\partial T/\partial x_i)(\varphi) = -T(\partial\varphi/\partial x_i)$. A function f is a multiplier for a space Φ if $\varphi \varepsilon \Phi$ implies $f\varphi \varepsilon \Phi$ and $\varphi_n \rightarrow 0$ in Φ implies $f\varphi_n \rightarrow 0$ in Φ.

Before sketching the applications to Cauchy's problem, it is necessary to list some of the spaces Φ and $\tilde{\Phi}$ obtained. The first space S discussed consists of all functions φ which have partial derivatives of all orders such that φ and all partial derivatives of $\varphi \rightarrow 0$ as $|x| \rightarrow \infty$ more rapidly than any power of $|x|^{-1}$ [see L. Schwartz, loc. cit., t. II, p. 89]. A sequence $\{\varphi_n\}$ of elements of S converges to 0 if and only if for every $\epsilon > 0$, natural number r, and mixed partial derivative D^q, $(1+|x|^2)^r|D^q\varphi_n(x)| \leqq \epsilon$ for all x and all $n \geqq$ some $n_0(r, q, \epsilon)$. The space K consists of all $\varphi \varepsilon S$ having compact support [see L. Schwartz, loc. cit., t. I, p. 21].

(CON'T)

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Gel'fand, I. M.

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The space K_p $(p>1)$ consists of all $\varphi \in S$ such that for all D^q, there exist constants C_1 and $C>0$ for which

$$|D^q\varphi(x)| \leq C_1 \exp\{-C|x|^p\}.$$

A sequence $\{\varphi_n\}$ in K_p converges to 0 if $\varphi_n \to 0$ uniformly in R^N and $|D^q\varphi_n(x)| \leq C_1 \exp\{-C|x|^p\}$, where C and C_1 depend upon q but not on n. The space Z^p $(p \geq 1)$ consists of all $\varphi(x) \in S$ which are extensible to analytic functions of the N complex variables

$$\{z_1, \cdots, z_n\} = \{x_1+iy_1, \cdots, x_N+iy_N\} = x+iy,$$

and such that

$$P[\varphi] = \int_{-\infty+iy}^{\infty+iy} |P(x+iy)\varphi(x+iy)|dx < C_1 \exp\{C|y|^p\},$$

where P is an arbitrary polynomial and C_1 and C are constants depending upon P and φ. A sequence $\{\varphi_n\}$ in Z^p converges to 0 if $\varphi_n(Z) \to 0$ uniformly on all compact subsets of complex N-space and $P[\varphi_n] \to 0$ for all P and y. The space $Z_p{}^p$ consists of all $\varphi(z_1, \cdots, z_n)$ which are analytic for all values of $z_1, \cdots, z_n$ and such that

(over)

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(*) $|\varphi(z_1, \cdots, z_N)| \leq K \exp\left\{\sum_{j=1}^{N} \epsilon_j C_j |z_j|^p\right\},$

where the C_j are positive constants and $\epsilon_j = +1$ for z_j non-real and $\epsilon_j = -1$ for z_j real ($j = 1, \cdots, N$). Convergence is defined as being uniform on compact sets and with uniform maintenance of a bound (*).

The Fourier transforms of these function-spaces are next computed ($p' = p/(p-1)$): $\tilde{S} = S$; $\tilde{K}_p = Z^{p'}$; $\tilde{Z}^p = K_{p'}$; $\tilde{K} = Z^1$; $\tilde{Z}^1 = K$; $\tilde{Z}_p{}^p = \tilde{Z}_{p'}{}^{p'}$. A detailed discussion of Fourier transforms of generalized functions for each of the function spaces is given.

The applications to Cauchy's problem follow the usual procedure. Let $u(x, t) = \{u_1(x, t), \cdots, u_m(x, t)\}$ be a vector function of $x = \{x_1, \cdots, x_N\}$ and the real variable t. Consider the system of differential equations

$$\frac{\partial u(x, t)}{\partial t} = P\left(\frac{1}{2\pi i}\frac{\partial}{\partial x}, t\right)u(x, t), \tag{1}$$

where P is an m^2-matrix whose elements are linear differential operators of various orders multiplied by continuous functions of t. The initial condition is $u(x, 0) = u_0(x)$. This system may be regarded as a system of equations in generalized vector-functions $T(\varphi) = \{T_1(\varphi), \cdots, T_m(\varphi)\}$, the unknown function u being replaced by an unknown generalized (CON'T)