

*Plisov, A. K.,*AUTHORS: Plisov, A. K., Bulatova, N. V.

79-2-48/64

TITLE: The Configuration and Properties of Unsaturated Acids and Their Derivatives (Konfiguratsiya i svoystva nepredel'nykh kislot i ikh proizvodnykh). VIII. On the Reactivity of Erucic- and Brassidic Acid and Their Esters (VIII. O reaktsionnoy sposobnosti erukovoy i brassidinovoy kislot i ikh efirov).

PERIODICAL: Zhurnal Obshchey Khimii, 1958, Vol. 28, Nr 2, pp. 498-503 (USSR)

ABSTRACT: The reactions of hydrogenation, oxidation, and saponification of the above acids were investigated in order to chemically determine their precise configuration. On the basis of the determinations of cryoscopic constants Mascarelli (ref. 2) ascribed to the erucic acid a ~~cis~~ and to the brassidic acid a trans-configuration. The same configuration was observed also by G. V. Pigulevskiy and P. A. Artamonov (ref. 3) by means of investigations carried out in the Raman spectrum. The chemical investigations described in the present work confirm the configurations found by means of physical methods. Erucic acid and its esters hydrogenize and oxidize faster than brassidic acid and its esters while they are slower saponifiable. The erucic acid is isolated according to a new method based on the solubility of lead erucate in alcohol. According to Holde the

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The Configuration and Properties of Unsaturated Acids and Their Derivatives. VIII. On the Reactivity of Erucic- and Brassidic Acid and Their Esters. 79-2-48/64

brassidic acid is obtained from erucic acid. Brassidic acid butyl ester was isolated for the first time. The oxidation of the acids and their esters was carried out by means of potassium bichromate in acetic acid at 40 and 55°C. Hydrogenation was carried out with Pd on BaSO<sub>4</sub> as catalyst on which occasional comparisons are made with works by Paal (ref. 6) and Fokin (ref. 7). The saponification of the erucates and brassidates was observed by means of the measurements of electric conductivity. The constants of reaction velocity of oxidation, hydrogenation, and saponification are given in a table. There are 4 tables, 9 references, 6 of which are Slavic.

ASSOCIATION: Odessa State University (Odesskiy gosudarstvennyy universitet).

SUBMITTED: January 19, 1957

AVAILABLE: Library of Congress

Card 2/2

PLISOV, A. K.

AUTHORS: Elisov, A. K., Paladiyenko, N. P.

79-2-49/64

TITLE: The Configuration and Properties of Unsaturated Acids and Their Derivatives (Konfiguratsiya i svoystva nepredel'nykh kislot i ikh proizvodnykh).  
IX. On the Properties of  $\alpha$ -Methyl Crotonic Acids and Their Esters (IX. O svoystvakh  $\alpha$ -metilkrotonovykh kislot i ikh efirov).

PERIODICAL: Zhurnal Obshchey Khimii, 1958, Vol. 28, Nr 2, pp. 503-507 (USSR).

ABSTRACT: Continuing previous investigations the angelic- and the tiglinic acids as well as their esters are investigated in order to determine their cis- and trans- configuration respectively. The result of the investigation obtained by Chyarosh (reference 2) is refuted and his results are explained by the excess of the applied quantity of catalyst. The differences of reactivity of the cis- and trans-forms are explained by the fact that in the case of trans-form the space of the double bond is filled from both sides by atomic groups with considerably greater volume than that of hydrogen, while in the case of cis-form one side of the space is less filled (planar projection). Butyl- and benzyl esters of angelic acid as well as butyl-, isobutyl- and benzyl esters of tiglinic acid hitherto not yet synthesized were produced. It was observed and graphically represented that the hydro-

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The Configuration and Properties of Unsaturated Acids and Their Derivatives. 79-2-49/64

generation of  $\alpha$ -methyl crotonic acid occurs much slower than that of the crotonic acid, i. e. that the  $\text{CH}_3$ -group in the  $\alpha$ -position to carboxyl obviously renders more difficult the addition of hydrogen to the double bond. It can also be seen from the graphical representation that the velocity of hydrogenation of ester is the slower the greater the alcohol radical. The lowering of temperature by  $10^\circ\text{C}$  on the occasion of the hydrogenation of the Pd-catalyst considerably slows down the addition velocity of hydrogen. According to the results obtained it is stated that angelic acid and its esters have cis-configuration while tiglinic acid and its esters show trans-configuration. The corresponding experimental data are given. There are 4 figures, and 5 references, 3 of which are Slavic.

ASSOCIATION: Odessa State University (Odesskiy gosudarstvennyy universitet).

SUBMITTED: January 26, 1957.

AVAILABLE: Library of Congress.

Card 2/2

PLISOV, A. K.

Category: USSR / Physical Chemistry / Kinetics. Combustion.  
Explosives. Topochemistry. Catalysis.

B-9

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 30067

Author : Plisov A. K., Stepanova O. S.

Inst : ~~Odessa University~~

Title : Preparation of Benzoic Acid by Decarboxylation of Phthalic Anhydride  
with Odessa Green Clay

Orig Pub: Tr. Odessk. un-ta, 1956, ser. khim., 146, No 5, 91-93

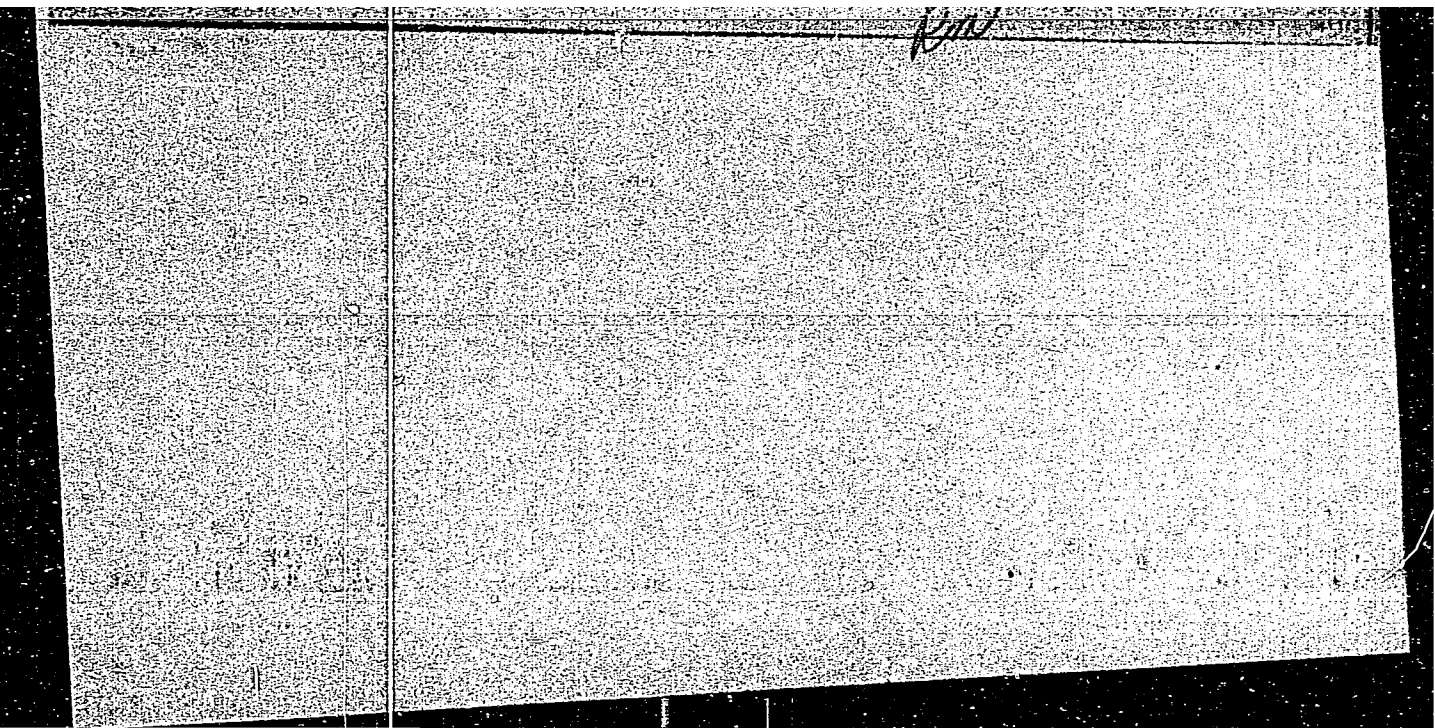
Abstract: On passing a mixture of phthalic anhydride and water vapor (at a ratio of about 1 : 6) at 400° and anhydride space velocity of about 0.1 g per g of catalyst per hour, over catalysts prepared from clay of the deposits of Shkodova Gora (I) and Arkadiyskoye Poberezh'ye (II), benzoic acid was obtained with a yield of about 31% over I, and of about 76% over II. With a catalyst (Al<sub>2</sub>O<sub>3</sub> + ZnO) deposited on pumice, under the same conditions, the yield is of 87-90%.

Card : 1/1

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"APPROVED FOR RELEASE: 08/23/2000

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CIA-RDP86-00513R001341310012-5"

PLISOV, A.K.; BOGATSKIY, A.V.

Configuration and properties of nonsaturated acids and their derivatives. Part 6: Reactivity of stereo-isomeric crotonic acids and their esters. Zhur. ob. khim. 27 no.2:360-364 P '57.  
(MLRA 10:6)

1. Odesskiy gosudarstvennyy universitet.  
(Isocrotonic acid)

7 3  
 Configuration and properties of unsaturated acids and their derivatives. VI. Reactivity of stereoisomeric crotonic acids and their esters. A. K. Plisov and A. V. Bogatski (State Univ., Odessa). *Zhur. Obshchei Khim.*, 27, 300-1 (1957), cf. *C. Z.* 49, 8189g; 50, 14522f.  $\text{AcCH}_2\text{CO}_2\text{Et}$  with  $\text{PCl}_5$  gave  $\text{MeCCl}_2\text{CHCO}_2\text{H}$ , which reduced with Na-Hg gave *cis*- $\text{MeCH}=\text{CHCO}_2\text{H}$ , b. 55-6°, b. 62-4°, m. 14°,  $n_D^{20}$  1.4130, which heated as the Ag salt with MeI gave the *Me* ester, b. 118°,  $n_D^{20}$  1.4175. Similarly were prepd.: *Bu* ester, b. 62°, b. 80-3°, 1.4280; *iso-Bu* ester, b. 55°, b. 53°, 1.4185; *iso-Am* ester, b. 74-6°, 1.4250. Heating the Na salt with  $\text{PhCH}_2\text{Cl}$  in dry MeOH gave the *benzyl* ester, b. 121-2°, 1.5110. *trans*- $\text{MeCH}=\text{CHCO}_2\text{H}$  heated with various alcs. in the presence of  $\text{H}_2\text{SO}_4$  gave the following esters: *Me*, b. 121°,  $n_D^{20}$  1.4230; *Bu*, b. 179-80°, 1.4283; *iso-Bu*, b. 171°, 1.4220; *iso-Am*, b. 182-3°, 1.4285. Heating the Na salt with  $\text{PhCH}_2\text{Cl}$  gave the *benzyl* ester, b. 125°,  $n_D^{20}$  1.5150. The esters were hydrogenated in EtOH over Pd  $\text{BaSO}_4$ , and the rates of hydrogenation were detd. The esters of the *cis* isomer add H much more rapidly than do those of the *trans* isomer; the same result was obtained over Pd and Pt in various solvents (EtOH or AcOH) at various temps. Increase in size of the ester radical decreases the rate of hydrogenation, particularly of the *trans* isomer. The results...

4E4j  
 4E2u



O. M. Kozlovskii

MT

Natural Segments  
Lubricants J. 11/1952

Steel Abstracts

4453. HIGH TEMPERATURE OILS AND GREASES. Misc., 1950 and  
Lubricants, vol. 23, part 1, 1950. (Appl. Chem. (U.S.S.R.), 1950  
vol. 23, 1277-1279., abstr. in Chem. Abstr., 1952, vol. 46, 4369.)

LOSSIYEVSKIY, Vladimir Leonidovich; PLISKIN, Leyb Gavrilovich; SHUMI-  
LOVSKIY, N.N., prof., doktor tekhn.nauk, otv.red.; KOTOV, V.A.,  
red.izd-va; SIMKINA, G.S., tekhn.red.

[Automatic control of continuous industrial processes] Voprosy  
avtomatizatsii nepreryvnykh proizvodstvennykh protsessov. Moskva.  
Izd-vo Akad.nauk SSSR, 1960. 111 p. (MIRA 13:7)  
(Automatic control)

PLIYEV, S. B. Cand Phys<sup>21</sup> Math Sci -- (diss) "On the equilibrium of elastic  
cylinder<sup>1</sup> of finite dimensions." Baku, 1956. 6 pp (Min of Higher Education  
USSR. Azerbaydzhan State Univ im S. M. Kirov). (KL, 41-59, 103)

IVANOV, Ye.R., kand. tekhn. nauk; PLOKHOTSKIY, M.A., kand. tekhn. nauk

Automatic control of the ELB-3 ballaster. Put' i put. khoz. no.8:5-6  
Ag '59. (MIRA 13:3)

(Railroads--Equipment and supplies)  
(Automatic control)

S/006/60/000/06/04/025  
B007/B005

AUTHORS: Voronin, V. A., Pik, L. I., Plonskiy, S. S.  
TITLE: Testing of the Optical Range Finder PA-300 (GD-300)  
PERIODICAL: Geodeziya i kartografiya, 1960, No. 6, pp. 14 - 23

TEXT: This is a report on tests of a model of the optical range finder PA-300 (GD-300) carried out by the Hidroproyekt Ministerstva stroitel'stva elektrostantsiy (Hidroproyekt of the Ministry for the Construction of Electric Power Plants) in the fall of 1959. It was developed on the basis of the range finder POW(GOI) with light modulation by diffraction (Ref., Footnote on p. 14). The device consists of an optical block, a phase-measuring block, a current source, and a reflector (Figs. 1,2). Fig. 3 shows a simplified scheme of the device. The device has some advantages over other optical range finders. It has a light modulator with some counter-ultrasonic transmitters, and the phase comparison is done by a separate phase detector (Fig. 3). On account of these two characteristics, distances up to 7 km can be measured in bright sunshine, up to 15 km in

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Testing of the Optical Range Finder  
ГД-300 (GD-300)

S/006/60/000/06/04/025  
B007/B005

dull weather, and much longer distances at night. Three light-modulation frequencies (10, 10.025, and 10.5 Mc/s) are used for range finding in this device. A one-sided optical telephone is used to maintain the connection to the operators of the reflector. The mode of operation of the device is explained. The following measurements were made during the field tests of the device: 1) Measurement of the side of the "frame triangulation" <sup>12</sup> established by the Hidroproyekt in 1955-1959 according to the program of the State triangulation of the 2nd order (used for observing the horizontal shifts of the Volzhskaya gidroelektrostantsiya im. V. I. Lenina (Volga Water Power Plant imeni V. I. Lenin)), and 2) measurement of the side of the triangulation of the 2nd order established by the Hidroproyekt in 1950-1952 (Figs. 4,5). The data for estimating the accuracy of measurement are given in Tables. To estimate the errors in longitudinal measurements, Tables 3 and 4 compare the sides measured by the optical range finder ГД-300 (GD-300) with those obtained by triangulation. On the basis of the tests carried out, some recommendations are given to improve the construction of the device. The test results showed that the device is well suited for the establishment of a network of topographic surveys in the planning of large hydraulic constructions. There are 5 figures, 4 tables, and

JB

Card 2/3

PLISOVSKAYA, A.

Efficiency promoters of the Ulan-Ude Meat Combine. Mias. ind.  
SSSR 29 no.5:47-48 '58. (MIRA 11:10)  
(Ulan-Ude--Packing houses--Equipment and supplies)

HOBLER, Tadeusz; PLISS, A.V. [translator]; ROMANKOV, P.G., red.

[Heat transfer and heat exchangers] Teploperedacha i teplo-  
obmenniki. Leningrad, Gos.nauchno-tekhn.izd-vo khim.lit-ry,  
1961. 819 p. (MIRA 16:2)  
(Thermodynamics) (Heat exchangers)



TSIBOROVSKIY, Yanush [Ciborowski, Janusz], prof., doktor-inzh., laureat  
Gosudarstvennoy Premii; MASLYANKA, E. [translator]; ~~PLISS, A.V.~~  
[translator]; ROMANKOV, P.G., prof., red.; KUROCHKINA, M.I., red.;  
ERLIKH, Ye.Ya., tekhn.red.

[Unit operations of chemical engineering] Protsessy khimicheskoi  
tekhnologii. Leningrad, Gos.nauchno-tekhn.izd-vo khim.lit-ry.  
1958. 932 p. (MIRA 12:12)

1. Varshavskiy politekhnicheskii institut (for TSiborovskiy).  
(Chemical engineering)

66558

SOV/81-59-15-53184

5.5000

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 15, p 130 (USSR)

AUTHORS: Stepin, V.V., Pliss, A.M., Silayeva, Ye.V.

TITLE: Methods for Determining Admixtures in Vanadium Metal. Communication 1.

PERIODICAL: Byul. nauchno-tekhn. inform. Ural'skiy n.-i. in-t Chern. metallov, 1958, Nr 4, pp 103-109

ABSTRACT: A photometric method has been developed for determining P in vanadium metal in the form of a blue phosphorus-molybdenum complex with preliminary separation of V on a H-cationite filter. For increasing the sensitivity of the method extraction of the blue complex by butyl alcohol has been applied. The method permits the determination of small quantities of P with an error of  $\pm 0.0005\%$ . A photometric method has also been developed for determining Si in vanadium metal in the form of a blue silicon-molybdenum complex with preliminary separation of V on a H-cationite filter. It has been established that for the preparation of the blue complex it is more expedient to apply Mohr's salt as a reducing agent; the error of determination is  $\pm 0.0075\%$ . The gravimetric method for determining Si in vanadium metal which is based on the separation of a gel of the silicic

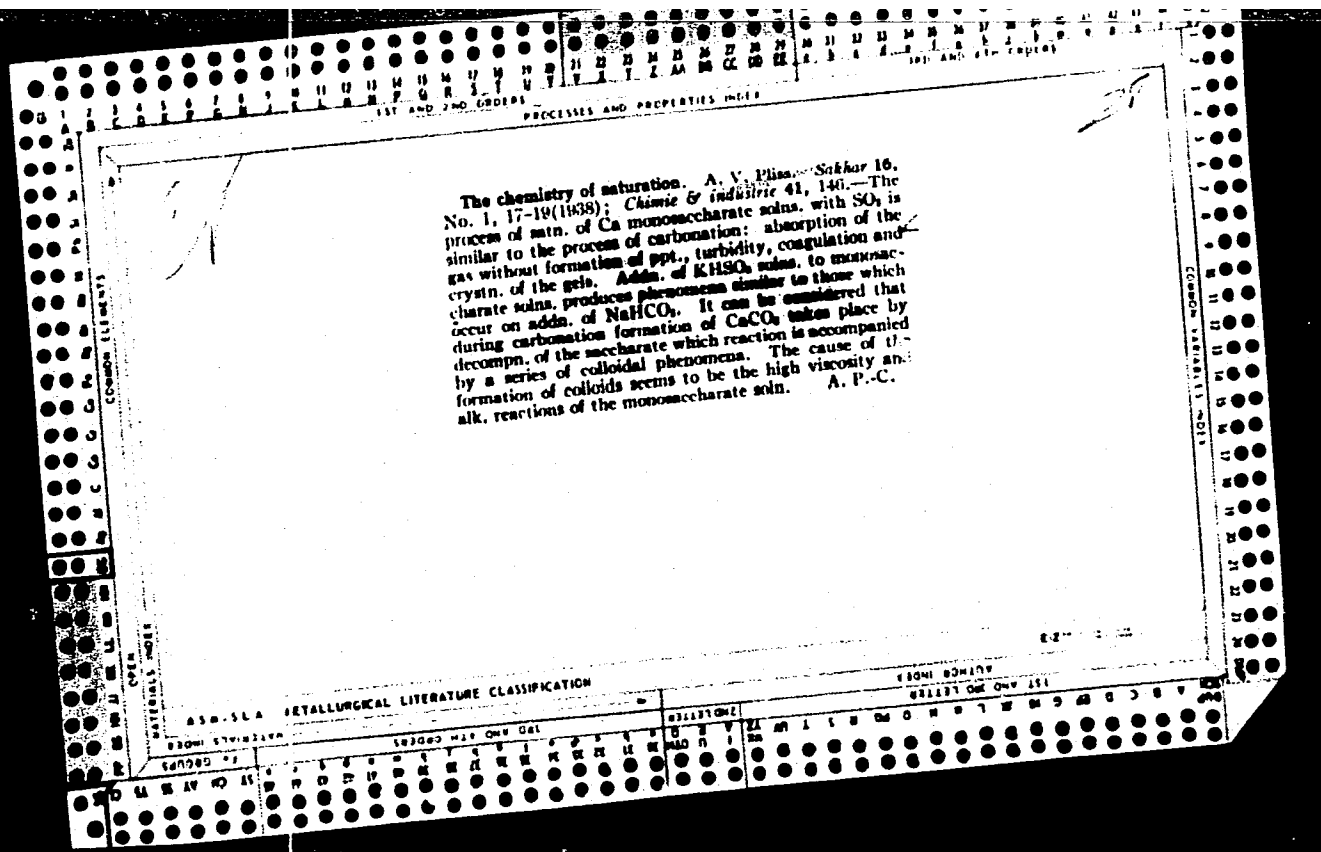
Card 1/2.

4

STEPIN, Vasil'y Vasil'yevich; SILAYEVA, Yelizaveta Vasil'yevna;  
PLISS, Anastasiya Mikhaylovna; KURBATOVA, Vera Ivanovna;  
KRYUCHKOVA, Lidiya Merkur'yevna; PONOSOV, Vladimir Il'ich;  
DYMOV, A.M., doktor khim. nauk, prof., red.; FEDOROV, A.A.,  
st. nauchn. sotr., red.; TKACHENKO, N.S., inzh., red.;  
DOBRZHANSKIY, A.V., st. inzh., red.; LEVIT, Ye.I., red. izd-  
va; ISLENT'YEVA, P.G., tekhn. red.

[Analysis of ferrous metals, alloys and manganese ores] Ana-  
liz chernykh metallov, splavov i margantsevykh rud. [By] V.V.  
Stepin i dr. Moskva, Metallurgizdat, 1964. 498 p.  
(MIRA 17:3)

1. Tsentral'nyy nauchno-issledovatel'skiy institut chernoy  
metallurgii (for Dymov, Fedorov, Tkachenko, Dobrzhanskiy).



ACC NR: AP7005389

(N)

SOURCE CODE: UR/0114/67/000/001/0035/0037

AUTHOR: Batshev, S. M. (Engineer); Pliss, D. A. (Engineer); Chernyakov, M. G. (Engineer)

ORG: none

TITLE: Spray-on heat insulation of power equipment

SOURCE: Energomashinostroyeniye, no. 1, 1967, 35-37

TOPIC TAGS: asbestos product, heat insulation, atomization, turbine stage

ABSTRACT: A new improved method of heat-insulation of turbines, employed in the West, is deposition of this insulation with the aid of a spray gun by using amphibole (blue) asbestos previously mixed with a binder and pneumatically supplied to the spray gun; on ejection from the spray gun the mixture is wetted with water and in this form settles on the surface of the equipment. This method has been introduced in the USSR on using chrysotile (serpentine) asbestos. The recipes for this mixture as used in the USSR provide for the use of asbestos in various proportions (chiefly 40 to 80%) to perlite, water glass, basaltic fiber or vermiculite or cement.

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UDC: 662.998.621.3.002.5

ACC NR: AP7005389

Special machinery has been developed for this purpose, as exemplified by the machine shown in Fig. 1,

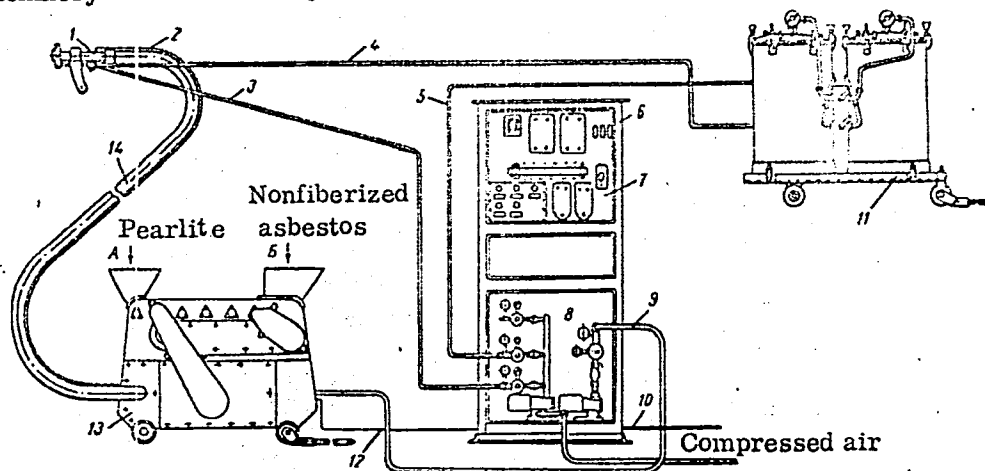


Fig. 1. Specialized installation for spray-on deposition of heat insulation on power equipment

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ACC NR: AP7005389

developed by the Tsentroneergoteploizolyatsiya Combine in Moscow: this machine performs the operations of proportioning and fiberizing of asbestos, proportioning of pearlite, mixing of pearlite with fiberized asbestos and supplying the ready mix to the spray gun. The heat insulation thus produced has been tested on 12 turbines with capacities of 50, 100 and 200 MW. The continuing extensive studies of the turbines with spray-on heat insulation indicate that all the advantages of amphibole asbestos insulation also are largely inherent in spray-on insulation consisting of chrysotile asbestos, pearlite and potash water glass (the binder). Such a heat insulation tightly adheres to the surface of even intricately shaped equipment and completely covers it, which contributes to a decrease in the temperature difference between the top and bottom of the metal of turbine cylinders and prolongs cooling time so as to preclude complete shutdown of the turbine, and it is resistant to vibrations and shocks and it chemically inert. Operating experience shows that, given an efficient organization of operations, the proportion of manual labor in the total volume of the operations involved in the production and deposition of spray-on insulation can diminish to as little as 12%. Orig. art. has: 4 figures, 1 table.

SUB CODE: 11, <sup>10</sup>US/SUBM DATE: none/ ORIG REF: 003

Card 3/3

PLISS, D.S., nauchnyy sotrudnik

Economics of secondary crops. Zhivotnovodstvo 24 no.5:20-23 My  
'62. (MIRA 16:10)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut kormov.



PLISS, D. S.

Feeding and Feeding Stuffs

Feed supply and increased yield of cows in the V. R. Vil'iams Feed Institute. Korm. baza 3  
No. 7, 1952.

9. Monthly List of Russian Accessions, Library of Congress, September 1952/1953, Uncl.

PLISS, G.B.

Cancerogenic properties of orthotoluidine. Zhur. VKHO 10  
no. 4:464 '65. (MIRA 18:11)

1. Institut onkologii AMN SSSR.

PLISS, G.B.

Carcinogenicity of benzidine. Vop. onk. 10 no.5:50-55 '64.

(MIRA 18:8)

1. Iz laboratorii eksperimental'noy onkologii (zav. - zasluzhennyy  
deyatel' nauki prof. N.V.Lazarev) Instituta onkologii AMN SSSR  
(dir. - deystvitel'nyy chlen AMN SSSR prof. A.I.Serebrov).  
Adres avtora: Leningrad, P-129, 2-yu berezovaya alleya, 3,  
Institut onkologii AMN SSSR.

PLISS, G.E.

Metabolism of carcinogenic aromatic amino compounds. (Rus. lang.)  
no.IC:107-112 '64. (MIRA 12:3)

1. Iz Instituta onkologii AMN SSSR (Fakultet . detskiy onkologicheskiy  
AMN SSSR prof. A.I.Serabrov). Adres avtorov Leningrad, Pechornoye, 2,  
ul. Leningradsкая, 48, Institut onkologii AMN SSSR.

PLISS, G.B.

New strain of osteogenic sarcoma in rats. Vop. onk. 11 no.3:  
77-84 '65. (MIRA 18:6)

1. Iz laboratorii eksperimental'noy onkologii (zav. - zas'uzhennyy  
deyatel' nauki prof. N.V. Lazarev) Instituta onkologii AMN SSSR  
(dir. - deystvitel'nyy chlen AMN SSSR prof. A.I. Serebrov).

5(3), 17(7)

SOV/63-4-2-30/39

AUTHOR: Pliss, G.B.

TITLE: The Problem of the Cancerogenic Effect of 3,3'-Dichlorobenzidine

PERIODICAL: Khimicheskaya nauka i promyshlennost', 1959, Vol 4, Nr 2, p 281 (USSR)

ABSTRACT: Dichlorobenzidine easily penetrates the uninjured skin, especially at high air temperature and humidity [Ref 3, 6]. The cancerogenic action of the substance was investigated on 111 white laboratory rats and 163 mice. The preparation in the form of a suspension was fed during 10 - 12 months. Among the rats 81%, among the mice 41,3% showed malignant tumors after this time. It has been proved that the tested substance has a high blastomogenic activity. There are 9 references, 1 of which is Soviet, 6 English, 1 German, and 1 Swiss.

ASSOCIATION: Institut onkologii (Institute of Oncology)

SUBMITTED: October 14, 1958

Card 1/1

PLISS, G.B.

Characteristics of the carcinogenic effect of N,N'-  
diacetylbenzidine. Vop. onk. 8 no.11:11-15 '62.

(MIRA 17:6)

1. Iz laboratorii eksperimental'noy onkologii (zav.- zasluzhennyy  
deyatel' nauki, prof. N.V. Lazarev, konsult'tant raboty - deystvitel'-  
nyy chlen AMN SSSR prof. L.M. Shabad) Instituta onkologii AMN  
SSSR (dir.- deystvitel'nyy chlen AMN SSSR prof. A.I. Serebrov).

EXCERPTA MEDICA Sec 16 Vol 7/6 Cancer June 59

1977. **Experimental tumours induced by dichlorbenzidine (Russian text)**  
Pliss G. B. Inst. of Oncol., USSR Acad. of Med. Scis, Leningrad *Byull. Eksper. Biol. i Med.* 1958, 46/10 (83-86) Tables 1

These experiments were carried out on 111 white rats. Oil or glycerine emulsions of the compound were administered s.c. or perorally. Of the 64 rats which survived till the appearance of the first tumour, 30 showed tumours at various sites, including 5 sarcomas at the site of administration.



PLISS, G.B. (Leningrad, ul. Plekhanova, d. 60, kv. 25)

Carcinogenic activity of dicyclohexylamine and of its nitrite salts  
[with summary in English]. Vop.onk. 4 no.6:659-669 '58.

(MIRA 12:1)

1. Iz laboratorii eksperimental'noy onkologii (zav. - chlen-korrespondent AMN SSSR prof. L.M. Shabad) Instituta onkologii AMN SSSR (dir. - deystv. chl. AMN SSSR prof. A.I. Serebrov).

(AMINES, effects,  
cyclohexylamines & nitrite deriv., carcinogenic  
activity (Rus))

(CYCLOHEXANES, effects,  
same)

(CARCINOGENS,  
cyclohexylamines & nitrite deriv. (Rus))

KHOLDIN, S.A., prof.; PLISS, G.B., kand.med.nauk.

The 93-rd meeting of the Scientific Society of Oncologists of  
Leningrad and Leningrad region. Vop. onk. 11 no.8:119 '65.  
(MIRA 18:11)

1. Chlen-korrespondent AMN SSSR (for Kholdin).

PLISS, G.B.

Carcinogenic effect of 3,3'-benzidinedioxypdiacetic acid (dipotassium salt). Vop. onk. 6 no.5:209-215 My '60. (MIRA 14:3)  
(ACETOACETIC ACID) (CARCINOGENS)

EXCERPTA MEDICA SEC 5 Vol 12/6 Gen. Path. June 59 <sup>CS,</sup> 6)

1305. EXPERIMENTAL TUMOURS INDUCED BY DICHLORBENZIDINE (Russian text) - Pliiss G. B. Inst. of Oncol. USSR Acad. of Med. Scis. Lenin-grad - BYULL. EKSPER. BIOL. I MED. 1958, 46/10 (83-86) Tables 1

These experiments were carried out on 111 white rats. Oil or glycerine emulsions of the compound were administered s. c. or perorally. Of the 64 rats which survived till the appearance of the first tumour, 30 showed tumours at various sites including 5 sarcomas at the site of administration.

(V. 16)

PLISS, G.B. (Leningrad, TSentr, ul. Plekhanova, d.60, kv.25)

Experimental studies on the carcinogenic effects of certain aromatic amines; aminodiphenyl derivatives. Vop.onk. 5 no.7:101-112 '59.  
(MIRA 12:12)

1. Iz laboratorii eksperimental'noy onkologii (zav. - chlen-korrespondent AMN SSSR prof. L.M. Shabad) Instituta onkologii AMN SSSR (dir. - deystvitel'nyy chlen AMN SSSR, prof. A.I. Serebroy).  
(DIPHENYL COMPOUNDS - effect injurious)  
(CARCINOGENS pharmacology)

PLISS, G. B. Cand Med Sci -- (diss) "Experimental morphological study of  
~~the blastomogenic action of a number of new products~~  
of the chemical industry (of the group of benzidine and dicyclohexylamine)."  
Len, 1959. 18 pp (Min of Health USSR. Central Sci Res Inst of Med Radiology),  
300 copies (KL, 50-59, 129)

PLISS, G.B. (Leningrad)

Study of the cancerogenic properties of some products of the aniline dye industry (1,5-naphthalenediamine and 1,8-naphthalenediamine hydrochloride). Gig.truda i prof.zab. 6 no.6: 44-48 Je '62. (MIRA 15:12)

1. Institut onkologii AMN SSSR.  
(ANILINE—TOXICOLOGY) (CARCINOGENS)

PLISS, G.B.

Experimental tumors induced in rats by dichlorobenzidine  
[with summary in English]. *Biul. eksp. biol. i med.* 46 no.10  
83-86 0 '58 (MIRA 11:11)

1. Iz laboratorii eksperimental'noy onkologii (zav. - chlen-  
korrespondent AMN SSSR L.M. Shabad) Instituta onkologii (dir.  
deystvitel'nyy chlen AMN SSSR A.I. Serebrov) AMN SSSR.  
Leningrad. Predstavlena deystvitel'nyy chlenom AMN SSSR N.N.  
Petrovym.

(CARCINOGENS, effects,  
dichlorobenzidine-induced carcinogenesis in rats  
(Rus))



PLISS, G. S.

Novye standarty na kranovye i metallurgicheskie elektrodvigateli.  
(Vestn. Mash., 1948, no. 3, p. 62-63)

New standards for crane and metallurgical electric motors.

ELC: TNh.Vh

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library  
of Congress, 1953.

PLISS, G.B.(Tikhvin)

New method for in vivo microscopic examination of tissue  
structures. Usp.sovr. biol. 39 no.3:374-379 My-Je '55.  
(MICROSCOPY, (MLRA 8:11)  
of living tissue)

PLISS, G.B. (Leningrad, ul. Plekhanova, d.60, kv. 25)

The 3,3'-dichlorobenzidine as a blastomogenic agent. Vop.onk. 5  
no.5:524-533 '59. (MIRA 12:12)

1. Iz laboratorii eksperimental'noy onkologii (zav. - chlen-korres-  
pondent AMN SSSR prof. L.M. Shabad) Instituta onkologii AMN SSSR  
(dir. - deystvitel'nyy chlen AMN SSSR prof. A.I. Serebrov).

(BENZIDINE, related cpds.

3,3'-dichlorobenzidine, blastomogenic action in rats  
& mice (Bns))

(CARCINOGENS, effects  
same)

PLISS, G.B.

Oncological characteristics of the new strain of lymphosarcoma in rats. *Biul. eksp. biol. i med.* no.2:95-99 F '61. (MIRA 14:5)

1. Iz laboratorii eksperimental'noy onkologii (zav. - chlen-korrespondent AMN SSSR prof. L.M.Shabad) Instituta onkologii (dir. - deystvitel'nyy chlen AMN SSSR A.I.Serebroy) AMN SSSR, Leningrad. Predstavlena deystvitel'nyy chlenom AMN SSSR N.G.Khlopinyam.  
(HODGKIN'S DISEASE)

EXCERPTA MEDICA Sec 2 Vol 12/10 Physiology Oct 59

4941. CARCINOGENIC ACTIVITY OF CYCLOHEXYLAMINE, DICYCLOHEXYLAMINE AND DICYCLOHEXYLAMINE NITRITE (Russian text) - Pliss G. B. Inst. of Oncol., AMS USSR, Leningrad - VOPR.ONKOL. 1958, 4/6 (659-669) Tables 2 Illus. 6

The carcinogenic activities of cyclohexylamine (I), dicyclohexylamine (II) and dicyclohexylamine nitrite (III) were investigated on 186 albino rats and 111 mice of the lower cancer strain 'D'. The compounds were administered orally and s.c. for about 12 months. No tumours were obtained after 23 months in rats fed I. Sarcomas at the site of injection of II were induced in 4 mice after 12-16 months. The same compound administered perorally caused omental and hepatic tumours in 2 rats. Visceral tumours were observed in 13 rats and mice receiving III orally or by injection. (V, 2, 16)

FLISS, G.B.

Carcinogenic properties of 3,3'-dihydroxybenzidine (should  
3,3'-dihydroxybenzidine be considered a basic carcinogenic  
metabolite of benzidine?) Vop.onk. 7 no.2:33-41 '61. (MIRA 14:5)

(BENZIDINE)

(CARCINOGENS)

PLISS, G.S., kand.tekhn.nauk

Concerning the standardization of electric machinery. Vest.  
elektroprom. 32 no.11:72-75 N '61. (MIRA 14:11)  
(Electric motors—Standards)  
(Electric generators—Standards)

KOTYREV, Ye.A.; PLISS, L.Ye.

Special spectral features of stable generation of oscillations in  
generators with delayed feedback in a weak mode of operation.  
Radiotekh. i elektron. 10 no.9:1628-1634 S '65.

(MIRA 18:9)



L 2314-66 EWT(1)/EWA(h) JM

ACCESSION NR: AP5022426

UR/0109/65/010/009/1628/1634  
621.373.018.424-187

AUTHOR: Kotyrev, Ye. A.; Pliss, L. Ye.

32  
B

TITLE: Spectral characteristics of stable oscillations generated by oscillators with weak delayed feedback

SOURCE: Radiotekhnika i elektronika, v. 10, no. 9. 1965, 1628-1634

TOPIC TAGS: traveling wave tube, microwave delay, microwave oscillator

ABSTRACT: Experimental studies of a <sup>25</sup>microwave oscillator with delayed feedback are reported. The oscillator, exhibiting several hundred natural frequencies, included a TWT amplifier and a waveguide delay line. The frequency characteristics were varied by the use of a variety of TW tubes and by varying tube voltages. With a sufficiently high gain (7-8 db), an oscillation with a complex spectrum was generated. The spectrum consisted of the sum of a large number of oscillations at natural frequencies. The number of components reached several hundreds with each component representing a noise-modulated oscillation. With filters introduced into the feedback circuit, the spectrum of each component contracted; in the limiting case, when the filter band was

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ACCESSION NR: AP5022426

less than  $\Delta f$ , a single monochromatic oscillation was observed. Contraction of the spectrum changed the shape of the spectral envelope from one resembling the frequency response of an open-loop oscillator to one resembling phase-modulated oscillation. Even with a relatively small number of components (filter, 50 Mc,  $\Delta f = 5-7$  Mc), a large number of stable spectral forms were observed. Orig. art. has: 7 figures, and 3 formulas. [PW]

ASSOCIATION: none

SUBMITTED: 03Jul64

ENCL: 00

SUB CODE: EC

NO REF SOV: 002

OTHER: 001

ATD PRESS: 4/04

Card 2/2 *nd*

LIPATOV, S.M. [Lipatau, S.M.] [deceased]; PLISS, N.M. [Plis, N.M.]

Phase demixing in the system polymer - polymer - solvent.  
Vestsi AN BSSR. Ser. fiz.-tekh. nav. no.3:64-68 '62.

(MIRA 18:3)

PLISS, V. A.

1/2

Pliss, V. A. A qualitative picture of the integral curves in the large and the construction with arbitrary accuracy of the region of stability of a certain system of two differential equations. Akad. Nauk SSSR. Prikl. Mat. Mch. 17, 541-554 (1953). (Russian)

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The following system has been investigated by Erugin [same journal 16, 620-628 (1952); these Rev. 14, 376]:

$$\dot{x} = f(x) + a'y, \quad \dot{y} = b'x + c'y,$$

$x(f(x) + c'x) < 0, x(c'f(x) - a'b'x) > 0$ , for  $x \neq 0$ ;  $f(0) = 0$ . Here  $a', b', c'$  are constants and  $f(x)$  is continuous. He showed that the origin is asymptotically stable, except possibly when  $c'^2 + a'b' = 0$ . In that case Erugin also showed [ibid. 14, 459-512 (1950); these Rev. 12, 412] that the transformation  $y \rightarrow a'y - c'x$  reduced the system to the form

$$(2) \quad \begin{cases} \dot{x} = y - \varphi(x), & \dot{y} = c\varphi(x) \\ c < 0; & \varphi(0) = 0; & x\varphi(x) > 0 \text{ for } x \neq 0. \end{cases}$$

The exceptional case arises only if

$$\lim \int_0^x \varphi(x) dx < \infty$$

as  $x \rightarrow +\infty$  or else as  $x \rightarrow -\infty$ . The author assumes this

Mathematical Review.  
June 1954  
Analysis

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(2)

Pliss, V. A.

situation and in addition that

$$\int_0^{+\infty} \varphi(x) dx = D < +\infty, \quad \int_0^{+\infty} \varphi(x) dx \leq \int_0^{-\infty} \varphi(x) dx,$$

$$\limsup \varphi(x) = a < +\infty \quad \text{as } x \rightarrow +\infty.$$

Under these conditions he determines the boundary of the region of asymptotic stability in the cases when this boundary exists. This boundary consists necessarily of trajectories (Erugin). Incidentally he obtains the phase-portrait of the trajectories outside the region of stability.

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

PLISS, V. A.

V. A. A connection between the region of stability and the region of uniform analyticity in the initial data of the solutions of a system of differential equations. Vestnik Leningrad Univ. 9 (1954), no. 11, 19-32. (Russian) 1-7/7

MS Let  $z = (z_1, \dots, z_n)$  denote a complex  $n$ -vector and let  $R$  be its space. Set  $(m) = (m_1, \dots, m_n)$ ,  $m_i > 0$ ,  $z^{(m)} = z_1^{m_1} \dots z_n^{m_n}$  and consider the equation

(1) 
$$\dot{z} = Z(z, t) = \sum P^{(m)}(t) z^{(m)}$$

where the  $P$ 's are continuous functions of the real variable  $t$  for  $t \geq 0$  and for all such  $t$  the sum converges throughout  $R$ . If  $c$  is an initial point, then for a region  $\|c\| < a$  and  $0 \leq t < T$  there is a solution due to Lyapunov

(2) 
$$f(c, t) = \sum L^{(m)}(t) c^{(m)}$$

where the  $L$ 's are differentiable functions of the time. Let

(over)

*Phase, V. C.*

$E_T CR$  be the set of points reached by that solution for some  $t \in [0, T)$ . Theorem 1.  $E_T$  is the neighborhood of the origin consisting of the points  $c$  for which  $f(c, t)$  is analytic for every  $t \in [0, T)$ .

The various types of stability (in the complex sense) may be defined for (1). Assume now that (1) is uniformly asymptotically stable (u.a.s.) (i.e. with constants independent of  $t$ ) in  $[0, +\infty)$ . If so, there will exist a region  $\Pi(a): |c_k| < a, (k=1, 2, \dots, n)$  such  $f(c, t)$  is bounded in  $\Pi(a)$  for all  $t$  and that  $f(c, t) \rightarrow 0$  as  $t \rightarrow +\infty$ . Theorem 2. A necessary and sufficient condition that the situation just described hold is that every  $L^{(m)}(f) \rightarrow 0$  as  $t \rightarrow +\infty$ .

Let now  $S'CR$  be the set of points  $c$  such that  $f(c, t) \rightarrow 0$  as  $t \rightarrow +\infty$ . Let  $S$  be the interior of  $S'$ . Every neighborhood of a boundary point of  $S$  contains a point  $c$  such that  $f(c, t)$  does not  $\rightarrow 0$  as  $t \rightarrow \infty$ . Theorem 3. If  $c \in S'$ , then  $f(c, t)$  is asymptotically stable (a.s.) relative to the neighboring solutions of (1).

*PLS., V.C.*

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A function  $f(z, t)$  is said to be uniformly analytic in a region  $U$  of  $R$  if its Taylor series about any  $z^0 \in U$  is uniformly convergent for  $\|z - z^0\| < \epsilon$  and  $t \in [0, +\infty)$ .

Theorem 4. If (1) is u.a.s. at the origin, then the set  $S$  is the uniformly analytic domain of  $f(c, t)$  which contains the origin. Corollary 1. The series (2) converge uniformly in the largest  $\Pi(a)$  contained in the stability region. At any point outside  $\Pi(a)$  at least one of the component series is not uniformly convergent relative to  $t \geq 0$ .

Corollary 2. Let the origin be u.a.s. Then a necessary and sufficient condition that it be a.s. in the large (i.e. that  $S' = R$ ) is that the series (2) converge uniformly in any bounded domain of  $R$  and for all  $t \geq 0$ . Corollary 3. At any boundary point of  $S$ ,  $f(c, t)$  is unbounded.

Consider now a system  $\dot{z} = Az + Z(z)$  where  $A$  is a constant matrix and  $Z$  has the form (2) with  $P$ 's constant and no linear terms. Let  $S$  be the domain of asymptotic stability (i.e. from which all trajectories lead to the origin).

Theorem 5. If the characteristic roots of  $A$  all have negative real parts then  $S$  is not bounded.

*S. Lefschetz (Princeton, N.J.)*

*1 - new. PAV*



*Pliss, V. A.*

**Pliss, V. A. Necessary and sufficient conditions for stability in the large for a system of  $n$  differential equations.** Dokl. Akad. Nauk SSSR (N.S.) 103 (1955), 17-18. (Russian) **1-F/W**

Erugin has given conditions for the stability in the large of the origin for a planar autonomous system of differential equations [see Prikl. Mat. Meh. 14 (1950), 459-512; MR 12, 412]. His treatment leans heavily upon the fact that the dimension is two. In the present note his theorem is extended to any dimension. Consider

(1)  $\dot{x} = X(x),$

where  $x, X$  are  $n$ -vectors,  $X(0) = 0$ , and  $X$  is continuous and satisfies uniqueness conditions for all  $x$ . Let  $L$  denote the hyperplane  $L(a, x) = a_1 x_1 + \dots + a_n x_n = 0$ . The path  $M(t)$  is said to cross  $L$  at  $M(t_1)$  at time  $t_1$  if there are times  $t_0 < t_1 \leq t_2 < t_3$  such that on the path  $L(a, x) = 0$  for  $t \in (t_1, t_2)$  while  $L(a, x) \neq 0$  for  $t \in (t_0, t_1)$  or  $(t_2, t_3)$  with opposite signs on the two intervals. Theorem: Necessary and sufficient conditions for asymptotic stability in the large of the origin are: I. The origin must be the only critical point of (1), and it must be stable. II. There exists an  $L$  such that: (a) if there corresponds to a path  $\Gamma$  a value  $T$  such that, for  $t > T$ ,  $\Gamma$  does not intersect  $L$ , then  $x(t) \rightarrow 0$  as  $t \rightarrow +\infty$ ; (b) there is a function  $v(x)$  defined on  $L$  such that  $v(0) = 0$ ,  $v(x) > 0$  for  $x \in L$  - the origin,  $v(x) \rightarrow +\infty$  with  $x$  on  $L$ ; (c) if the path  $M(t)$  meets  $L$  at two points  $M(t_1), M(t_2)$ ,  $t_2 < t_1$  then  $v(M(t_1)) > v(M(t_2))$ .

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*Leningrad State Univ in A. P. Zhdanov*

Pliss, U. A.

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Necessity is proved by reference to Barbašin and Krasovskii [ibid. 18 (1954), 345-350; MR 15, 957]. In outline sufficiency is established as follows: Let the path  $M(t)$  cut  $L$  at times  $\{t_k\} \rightarrow +\infty$ . Owing to IIbc, the points  $M(t_k)$  are in a bounded neighborhood  $v \leq v(M(t_1))$ . Hence  $M(t)$  has an  $\omega$  limit-point  $A$  in that set. By I and II one may show that  $A$  is the origin and from I that it is the only  $\omega$ -limit point of  $M(t)$ , and sufficiency follows.

The theorem is applied to show that: (a) the origin is stable in the large for

(2)  $\dot{x}=y, \dot{y}=x-ay, \dot{z}=-\varphi(y)-bx,$

where  $a, b$  are positive constants,  $\varphi(0)=0$ ,  $\varphi$  is continuous and satisfies a uniqueness condition and  $\varphi(y)/y > b/a$  for  $y \neq 0$ . This generalizes a result of Barbašin [ibid. 16 (1952), 629-632; MR 14, 376]; (b) the origin is stable in the large for

(3)  $\dot{x}=y, \dot{y}=x-f(x), \dot{z}=-by-cz,$

where  $b, c$  are positive constants such that  $c^2 - 4b > 0$ , and  $f(0)=0$ ,  $f$  is continuous, satisfies a uniqueness condition and  $x/f(x) > 0$  for  $x \neq 0$ . S. LeSchetz (Princeton, N.J.).

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PLISS, V.A.

SUBJECT USSR/MATHEMATICS/Differential equations CARD 1/3 PG - 613  
 AUTHOR PLISS V.A.  
 TITLE Investigation of a non-linear differential equation of third order.  
 PERIODICAL Doklady Akad.Nauk 111, 1178-1180 (1956)  
 reviewed 2/1957

The author investigates the qualitative behavior of the solutions of the special differential equation of third order

$$(1) \quad \frac{d^3 \xi}{dt^3} + f\left(\frac{d^2 \xi}{dt^2}\right) + \frac{d\xi}{dt} + \xi = 0,$$

where the non-linear function  $f$  is assumed to be continuous and satisfying the Lipschitz condition for all real values of the argument; besides let be valid:

$$f(0) = 0; \quad \eta f(\eta) > \eta^2 \text{ for } \eta \neq 0.$$

Obviously (1) is equivalent to the system

$$(2) \quad \dot{x} = y - f(x), \quad \dot{y} = z - x, \quad \dot{z} = -x.$$

Let  $\varphi(p, t)$  be that trajectory of (2) which in the moment  $t = 0$  is going through the point  $p$  of the phase space. The following results are formulated without

Doklady Akad.Nauk 111, 1178-1180 (1956)

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proof:

1. Every trajectory of the system (2) which completely lies in the half space  $x < 0$  or  $x > 0$ , tends to the point  $x = y = z = 0$  as  $t \rightarrow \infty$ .
2. If  $p$  lies in  $x = 0$ , then  $\varphi(p, t)$  intersects the plane  $x = 0$  for  $t > 0$ .
3. If  $p$  lies in  $x = 0$  and is different from  $x = y = z = 0$  and  $t_1 > 0$  and  $t_2 > t_1$  correspond to two consecutive intersection points (to the first and the second one) of  $\varphi(x, t)$  with  $x = 0$ , then two cases are possible:  
 I.:  $y(\varphi(p, t_1)) > 0$ ,  $z(\varphi(p, t_1)) > 0$  and  $y(\varphi(p, t_2)) < 0$ ,  $z(\varphi(p, t_2)) < 0$ ;  
 II.:  $y(\varphi(p, t_1)) < 0$ ,  $z(\varphi(p, t_1)) < 0$  and  $y(\varphi(p, t_2)) > 0$ ,  $z(\varphi(p, t_2)) > 0$ .
4. If  $f(x)$  is holomorphic in the neighborhood of  $x = 0$ , then in each of the half spaces  $x > 0$  and  $x < 0$  there exists only one trajectory which is lying completely in this half space.
5. The region of stability of the trivial solution in the sense of Liapunov is unbounded.
6. If there exists the derivative  $\frac{df}{dx}$  and if  $\frac{df}{dx} > 1$  for all  $x$ , then the trivial solution is stable in the large.
7. If there exist numbers  $\varepsilon > 0$  and  $x_0 \geq 0$  such that for  $|x| \geq x_0$  also  $f'(x) - 1 > \varepsilon$ , then there exists an  $R$  such that for  $y_0^2 + z_0^2 \geq R^2$  on  $\varphi(p, t)$

Doklady Akad.Nauk 111, 1178-1180 (1956)

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the condition  $y^2(t_2)+z^2(t_2) < y_0^2+z_0^2$  is satisfied and for  $y_0^2+z_0^2 < R^2$  on

$\varphi(p,t)$  the condition  $y^2(t_1)+z^2(t_1) < R^2$  is valid. Every trajectory which does not go through 0, intersects the domain  $P(x=0, y^2+z^2 < R, y > 0, z > 0)$ .

A further theorem gives necessary and sufficient conditions for absence of periodic solutions. The possibility of the existence of periodic solutions is shown by an example.

INSTITUTION: Zdanov-University, Leningrad.

ACCESSION NR: AP4016498

S/0020/64/154/005/1044/1046

AUTHOR: Pliss, V. A.

TITLE: On a reduction principle in the theory of stability of motion

SOURCE: AN SSSR. Doklady\*, v. 154, no. 5, 1964, 1044-1046

TOPIC TAGS: stability theory, Lyapunov theory, ordinary differential equation, nonlinear mechanics, nonlinear differential equation

ABSTRACT: Given system

$$\frac{dx}{dt} = Ax + p(x, y), \quad \frac{dy}{dt} = By + q(x, y), \quad (1)$$

where  $x$  is an  $n$ -vector,  $y$  an  $m$ -vector;  $A$  and  $B$   $n \times n$  and  $m \times m$  matrices, respectively;  $p$  and  $q$  vector functions with norms  $\|p\|$ ,  $\|q\|$ , which are small in comparison with  $\|x\|$  and  $\|y\|$ . The problem is that of the existence and construction of a vector function  $p^*(x)$  such that the zero solution of

$$\frac{dx}{dt} = Ax + p^*(x) \quad (2)$$

has the same stability properties as the zero solution of (1). Earlier results apply only to the algebraic case, for only in that case does it make sense to speak of a solution "unstable independently of

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ACCESSION NR: AP4016498

terms of degree greater than N." The reduction principle proved in this paper applies to the transcendental as well as the algebraic case. The proof (not given) is based on Banach's principle following ideas suggested by Bogolyubov, so that  $f$  can be constructed by successive approximations. In the case of instability, the proof given uses the invariance of the hypersurface  $y=f(x)$ . In the case of stability (or asymptotic stability), the change of variable  $\varphi$  is used so that  $\varphi$  satisfy differential system  $\frac{d\varphi}{dt} = A\varphi + p_1(\varphi, \psi, \xi, t)$ ,  $\frac{d\psi}{dt} = B\psi + q_1(\varphi, \psi, \xi, t)$ .

and initial conditions  $p_1(0, 0, \xi, t) = 0$ ,  $q_1(0, 0, \xi, t) = 0$

Any solution  $x(t, x_0, y_0)$ ,  $y(t, x_0, y_0)$  of (1), for sufficiently small  $\|x_0\|$ ,  $\|y_0\|$ , can be written in the form

$$x(t, x_0, y_0) = x(t, \xi, f(\xi)) + \varphi(t, \xi, a), \quad y(t, x_0, y_0) = y(t, \xi, f(\xi)) + \psi(t, \xi, a)$$

(because there exist  $\xi$  and  $a$  such that  $x_0 = \xi + \varphi(0, \xi, a)$ ,  $y_0 = f(\xi) + \psi(0, \xi, a)$ .) Orig. art. has: 19 sets of equations or inequalities.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova (Leningrad State University)  
Card 2/3

PLISS, Y. A. Cand Phys-Math Sci -- (diss) "The qualitative study of <sup>4 single</sup> ~~one~~  
nonlinear differential equation of the third order." Len, 1957, 7 pp  
(Len Order of Lenin State Univ im A. A. Zhdanov), 100 copies (KL, 44-57, 99)



PHASE I BOOK EXPLOITATION 851

Pliss, V.A.

Kachestvennoye issledovaniye odnogo nelineynogo differentsial'nogo uravneniya tret'yego poryadka; avtoreferat dissertatsii na soiskaniye uchenoy stepeni kandidata fiziko-matematicheskikh nauk (Qualitative Study of a Nonlinear Differential Equation of the Third Order; Author's Abstract of a Dissertation Offered for the Degree of Candidate of Physical and Mathematical Sciences) Leningrad, Leningradskiy Universitet, 1957. 6 p. 100 copies printed.

Sponsoring Agency: Leningrad. Universitet.

PURPOSE: This booklet is the author's abstract of a dissertation offered for the degree of candidate of Physical and Mathematical Sciences.

COVERAGE: According to the abstract, the dissertation consists of six sections. The content of each chapter is briefly described. The first section states that the dissertation deals with the study of a particular case of Ayzerman's problem (Ayzerman, M.A., Ob odnoy probleme Kasayushcheycya ustoychivosti "v bol'shom" dinamicheskikh sistem - One Problem Concerning the Stability of Dynamic Systems in the Large, Uspekhi matematicheskikh nauk, 1949, Vol.IV.,No.4.)

Card 1/3

Qualitative Study of a Nonlinear Differential (Cont.) 851

The nonlinear equation of the third order

$$\frac{d^3 \xi}{dt^3} + f\left(\frac{d^2 \xi}{dt^2}\right) + \frac{d\xi}{dt} + \xi = 0 \quad (1)$$

is investigated, which by substitution of variables can be reduced to a system of differential equations:

$$\frac{dx}{dt} = y - f(x), \quad \frac{dy}{dt} = z - x, \quad \frac{dz}{dt} = -x \quad (2)$$

where  $f(x)$  satisfies generalized Hurwitz conditions:

$$f(0) = 0, \quad xf(x) > x^2 \text{ at } x \neq 0.$$

the author states that many mathematicians have studied particular cases of the system of three equations of the Aizerman type, and have succeeded in constructing Lyapunov's function of special form (integral of a nonlinearity plus quadric form of coordinates of a phase space). It is stated that for system (2) it is impossible to construct Lyapunov's function of such a form and therefore study of system (2) is of special interest. Section 2 contains a detailed study of the behavior of integral curves of system (2). Using qualitative methods three theorems are proved concerning the behavior of integral curves. In Section 3, sufficient conditions are given for the stability of zero solutions of system (2) in the large. Proof is given

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Qualitative Study of a Nonlinear Differential (Cont.)

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for a theorem which states that if  $f'(x) > 1$  for all real values, then the trivial solution of system (2) is stable in the large. Sections 4 and 5 deal with the behavior of the trajectories of system (2) when the condition of the theorem of Section 3 is satisfied only in infinity. Four theorems are proved concerning the behavior of trajectories and sufficient and necessary conditions for the stability of the trivial solution of system (2) are given. In Section 6 sufficient conditions are given for the existence of periodic motion of system (2) distinct from the state of equilibrium. No personalities are mentioned. There are no references. No Table of Contents is given.

AVAILABLE: Library of Congress (QA372.P68)

Card 3/3

LK/mas  
11-26-58

PLISS, V.A.

AUTHOR: PLISS, V.A.

20-2-6/50

TITLE: Investigation of a Non-linear System of Three Differential Equations (Issledovaniye odnoy nelineynoy sistema trekh differentsial'nykh uravneniy)

PERIODICAL: Doklady Akademii Nauk <sup>SSSR</sup>, 1957, Vol. 117, Nr 2, pp 184-187 (USSR)

ABSTRACT: Under the assumption  $a_{22} + a_{33} = 0$  the author considers the system.

$$(1) \quad \dot{x} = f_1(x) + a_{12}y + a_{13}z, \quad \dot{y} = a_{21}x + a_{22}y + a_{23}z,$$

$$\dot{z} = a_{31}x + a_{32}y + a_{33}z.$$

After a transformation of the coordinates one obtains:

$$(2) \quad \dot{x} = y - f(x), \quad \dot{y} = z - x, \quad \dot{z} = -ax - bf(x).$$

It is assumed that  $f(x)$  satisfies the Lipschitz condition and the generalized Hurwitz conditions:

$$\frac{f(x)}{x} > a + b \frac{f(x)}{x} > 0 \quad \text{for } x \neq 0; \quad f(0) = 0.$$

By applying qualitative and Lyapunov methods the author obtains a great number of statements (among them 12 theorems) e.g.: each of the following conditions is necessary and sufficient

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Investigation of a Non-linear System of Three Differential Equations 20-2-6/50

for the asymptotic stability of the trivial solution of (2)  
for an arbitrary function  $f(x)$  :

1).  $a < 0$  ,  $b > 0$

2).  $a = 0$  ,  $0 < b < 1$

3).  $a > 0$  ,  $b < 0$  ,  $a^2 + b(1-b)^2 \leq 0$

6 Soviet references are quoted.

ASSOCIATION: State University imeni A.A. Zhdanov, Leningrad (Leningradskiy gosudarstvennyy universitet imeni A.A. Zhdanova)

PRESENTED: By V.I. Smirnov, Academician, 27 May, 1957

SUBMITTED: 21 May 1957

AVAILABLE: Library of Congress

Card 2/2

16 (1)

PHASE I BOOK EXPLOITATION

SOV/1647

Pliss, Viktor Aleksandrovich

Nekotoryye problemy teorii ustoychivosti dvizheniya v tselom (Certain Problems of the Theory of Stability of Motion in the Large) [Leningrad] Izd-vo Leningradskogo univ-ta, 1958. 181 p. 3,300 copies printed.

Sponsoring Agency: Leningrad. Universitet.

Ed.: Ye.V. Shchemeleva; Tech. Ed.: A.V. Semenova.

**PURPOSE:** The book contains original results of the author's studies and may be useful to specialists in the qualitative theory of differential equations and the theory of automatic control.

**COVERAGE:** Some nonlinear systems of three differential equations of the Ayzerman type are studied. It is assumed that nonlinearities contained in the systems satisfy the generalized Hurwitz conditions. Sufficient conditions of stability in the large and conditions under which the systems studied have periodic solutions are given. Upon the parameters of a system, necessary and

Card 1/3

Certain Problems of the Theory (Cont.)

SOV/1647

sufficient conditions of stability in the large are imposed, which are valid for any nonlinearity. Soviet personalities mentioned in connection with publications used in the author's study include M.A. Ayzerman, N.N. Krasovskiy, N.P. Yerugin, I.G. Malkin, A.A. Andronov, A.G. Mayyer, and V.V. Nemytskiy. The author thanks N.P. Yerugin, V.I. Smirnov and V.P. Basov for their help in preparing the book. There are 44 references, of which 37 are Soviet, 4 English, 2 German and 1 Italian.

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LK/ad  
6-12-59



PLISS, V.A.

Uniformity of motion determined by a system of three differential equations. Dokl.AN BSSR 2 no.10:403-407 N '58.

(MIRA 12:8)

1. Predstavleno akademikom AN BSSR N.P.Yeruginym.  
(Differential equations)

AUTHOR: Pliss, V.A.

20-120-4-6/67

TITLE: Necessary and Sufficient Stability Conditions in the Large for a System of Three Differential Equations (Neobkhodimyye i dostatochnyye usloviya "stoychivosti v tselom dlya odnoy sistemy trekh differentsial'nykh uravneniy)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 120, Nr 4, pp 708-710 (USSR)

ABSTRACT: The author considers the system

$$(1) \frac{dx}{dt} = y - ax - f(x), \quad \frac{dy}{dt} = z - bf(x), \quad \frac{dz}{dt} = -cf(x),$$

where  $ab > c$ ,  $b > 0$ ,  $c > 0$ ,  $f(0) = 0$ ,  $xf(x) > 0$  for  $x \neq 0$  and  $f(x)$  is so that there exists a unique solution.

Theorem: In order that the vanishing solution of (1) is stable in the large it is necessary and sufficient that

$$\overline{\lim}_{x \rightarrow +\infty} \left( f(x) + \int_0^x f(x) dx \right) = +\infty$$

$$\overline{\lim}_{x \rightarrow -\infty} \left( -f(x) + \int_0^x f(x) dx \right) = +\infty .$$

Card 1/2

Necessary and Sufficient Stability Conditions in the  
Large for a System of Three Differential Equations

20-120-4-6/67

By the construction of a Lyapunov function [Ref 1,2] it re-  
sults that the conditions are sufficient. The necessity is  
proved by a very difficult indirect proof.  
There are 2 Soviet references.

PRESENTED: January 24, 1958, by V.I. Smirnov, Academician

SUBMITTED: January 19, 1958

1. Differential equations

Card 2/2

AUTHOR: Pliss, V.A.

SOV/20-121-3-7/47

TITLE: On the Problem of Ayzerman in the Case of a System of Three Differential Equations (O probleme Ayzermana dlya sluchaya sistemy trekh differentsial'nykh uravneniy)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 121, Nr 3, pp 422-425 (USSR)

ABSTRACT: The author considers the system

$$(1) \frac{dx}{dt} = y + f(x), \quad \frac{dy}{dt} = z + ax + bf(x), \quad \frac{dz}{dt} = cx + df(x),$$

where  $f(0)=0$ ,  $\frac{f(x)}{x} < 0$ ,  $d \cdot \frac{f(x)}{x} + c < 0$  and  $b \frac{f^2(x)}{x^2} +$

$+ (a + d) \frac{f(x)}{x} + c > 0$  for  $x \neq 0$  and furthermore the unique-

ness of the solution is guaranteed.

It is shown that, if

$$(2) \quad b > 0, \quad d > 0, \quad (a + d)^2 - 4bc < 0$$

or

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On the Problem of Ayzermann in the Case of a System  
of Three differential Equations

SOV/20-121-3-7/47

(3)  $b > 0$ ,  $d > 0$ ,  $(a + d)^2 - 4bc \geq 0$ ,  $-\frac{c}{d} < \min \{A, 0\}$ , where

$A = \frac{-(a+d) - \sqrt{(a+d)^2 - 4bc}}{2b}$ , the trivial solution of (1) is

stable in the large. In the cases where (2) and (3) are not satisfied, the author gives functions  $f(x)$  for which the zero solution is no longer stable in the large. 13 theorems are formulated without proof in which all single cases in question are comprehended.

There are 7 Soviet references.

PRESENTED: March 21, 1958, by V.I. Smirnov, Academician  
SUBMITTED: March 13, 1958

Card 2/2

16(1)

AUTHOR:

Pliss, V.A.

SOV/20-127-5-7/58

TITLE:

On the Number of Periodic Solutions of an Equation With  
Polynomial Right Side

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 5, pp 965-968 (USSR)

ABSTRACT:

Let the differential equation

$$(1) \quad \frac{dy}{dx} = y^n + p_1(x)y^{n-1} + \dots + p_{n-1}(x)y + p_n(x)$$

be given, where all  $p_i(x)$  in  $x$  possess the period  $\omega$  and it is

$$(2) \quad |p_i(x_1) - p_i(x_2)| \leq L|x_1 - x_2|$$

Furthermore let

$$(5) \quad |p_i(x)| \leq M_i .$$

Let the space  $R_n$  of all vector functions  $P(x) = (p_1(x), \dots, p_n(x))$  be considered. The points of the space are denoted as equations, since  $P(x)$  defines the equation (1). Let  $R_n$  be characterized by  $\omega, L, M_1, \dots, M_n$ , i.e.  $R_n = R_n(\omega, L, M_1, \dots, M_n)$ .

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On the Number of Periodic Solutions of an Equation  
With Polynomial Right Side

SOV/20-127-5-7/58

$$(6) \quad \|P_1 - P_2\| = \max_i \left\{ |p_i^{(1)} - p_i^{(2)}| \right\}$$

is introduced. Let  $s + 1$  ( $s \geq 1$ ) numbers  $x_0 < x_1 < \dots < x_s$  exist so that  $x_s - x_0 = \omega$ . Let on  $(x_{i-1}, x_i)$  be defined a solution  $y = y_i(x)$  tending to infinity for  $x \rightarrow x_{i-1}$  and  $x \rightarrow x_i$ . Here let the following condition be satisfied: If  $y_i(x)$  tends to  $\infty$  for  $x \rightarrow x_{i-1}$  and if it remains for  $x$  adjacent to  $x_i$  in the domain  $G_k$ , then  $y_{i+1}(x)$  tends to infinity for  $x \rightarrow x_i$  and remains in  $G_{k-1}$  or  $G_{k+1}$  for  $x$ -values sufficiently near  $x_i$ . Here it is

$$G_k = \left\{ r > \vartheta, \frac{k\bar{r}}{n-1} - \frac{a}{r} < \varphi < \frac{k\bar{r}}{n-1} + \frac{a}{r} \right\} \text{ and the positive constants}$$

$a$  and  $\vartheta$  are chosen so that the  $\bar{G}_k$  do not overlap and their boundaries have no contact with the linear field of elements

Card 2/4

On the Number of Periodic Solutions of an Equation  
With Polynomial Right Side

SOV/20-127-5-7/58

of (1). Definition : The system of the solutions  $y = y_i(x)$   
( $i = 1, \dots, s$ ) is called singular periodic solution of (1).

Theorem 1 : Let  $P_\nu \in R_n$  and  $P_\nu \rightarrow P_0$  for  $\nu \rightarrow \infty$ . If every  
 $P_\nu$  possesses a singular periodic solution, then also  $P_0$

possesses such a solution. Theorem 3 : If  $P$  possesses infinite-  
ly many periodic solutions, then it possesses a singular  
periodic solution too. Theorem 4 :  $P_0$  is assumed to possess

no singular periodic solution. There exists an  $\epsilon$  so that, if  
 $\|P - P_0\| < \epsilon$ , the equations  $P$  and  $P_0$  possess equally many

periodic solutions. Theorem 5 : Let  $|p_i(x)| \leq M$ ,

$\omega \leq 2\sqrt{2} : (n-1)(1 + \sqrt{2})B^{n-1}$ , where  $B > 0$  is the root of

$B^n(B-1) = M\sqrt{2}(B^n - 1)$ . Then (1) has exactly  $n$  periodic  
solutions, if they are counted with their multiplicities.

Altogether there are 6 theorems. N.V. Adamov is mentioned in  
the paper.

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On the Number of Periodic Solutions of an Equation  
With Polynomial Right Side

SOV/20-127-5-7/58

There is 1 American reference.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet imeni A.A.  
Zhdanova (Leningrad State University imeni A.A. Zhdanov)

PRESENTED: April 25, 1959, by V.I. Smirnov, Academician

SUBMITTED: April 16, 1959

Card 4/4

16.34/00

81244  
S/043/60/000/13/02/016AUTHOR: Pliss, V.A.TITLE: On the Structural Stability of the Differential Equation<sup>16</sup> on the Torus<sup>16</sup>

PERIODICAL: Vestnik Leningradskogo universiteta, Seriya matematiki, mekhaniki i astronomii, 1960, No. 13, pp. 15 - 23

TEXT: The equation

$$(1.1) \quad \frac{d\theta}{d\varphi} = f(\varphi, \theta),$$

where  $f$  has the period  $2\pi$  in both arguments, is continuous and guarantees the uniqueness of the solution of (1.1), is considered on a torus. Let  $\theta = \theta_0 = F(\varphi, \theta_0)$  be that solution of (1.1) for which  $\theta = \theta_0$  for  $\varphi = 0$ . Let  $f(\varphi, \theta, \alpha)$  be continuous in the point  $(\varphi, \theta, \alpha_0)$  and in a neighborhood of this point let it have the same properties as  $f(\varphi, \theta)$  in (1.1). Let  $\mu = \mu(\alpha)$  be the rotation number of

$$(1.2) \quad \frac{d\theta}{d\varphi} = f(\varphi, \theta, \alpha).$$

Theorem 1 : The function  $\mu(\alpha)$  is continuous in the point  $\alpha_0$  X

Card 1/3

On the Structural Stability of the Differential Equation on the Torus 812hh  
S/043/60/000/13/02/016  
C111/C222

Theorem 2 : In order that (1.1) has a stable rotation number it is necessary and sufficient that  $\mu$  is rational :  $\mu = \frac{p}{q}$  and the function

$$(1.11) \quad g(\theta_0) = F(2\pi q, \theta_0) - 2\pi p - \theta_0$$

has a changing sign.

Theorem 3 is another formulation of theorem 2 for  $f(\varphi, \theta)$  analytic in  $\theta$ .

Let  $\mu = \frac{p}{q}$  be the rotation number of (1.1). Let the periodic solution  $\theta = F(\varphi, \theta_1)$  of (1.1) go through the point  $\theta = \theta_1, \varphi = 0$ . Let

$$(2.4) \quad h(\theta_1) = \frac{1}{2\pi q} \int_0^{2\pi q} \frac{\partial f}{\partial \theta} \Big|_{\theta=F(\varphi, \theta_1)} d\varphi.$$

Theorem 2.1 : In order that the equation (1.1) is structurally stable it is necessary and sufficient that its rotation number is rational and that the characteristic exponent  $h(\theta_1)$  corresponding to an arbitrary periodic solution

Card 2/3 ✓

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SOV/103-21-1-20/22

**AUTHORS:** Rozenvasser, Ye. N., Pliss, V. A.

**TITLE:** Letter to the Editor

**PERIODICAL:** Avtomatika i telemekhanika, 1960, Vol 21, Nr 1, p 144 (USSR)

**ABSTRACT:** The authors of the letter have found certain errors in the study of Yu. S. Sobolev: "Concerning Absolute Stability of Certain Control Systems," Avtomatika i telemekhanika, 1959, Nr 4. They ask the definition of the Routh-Hurwitz stability criterion in the general form for the system described by Eqs. (1) and (2) of the study. The authors of the letter state also that the region of absolute stability(13) of the study does not coincide with the region of asymptotic stability (14) of the system. The proof given by Yu. S. Sobolev is wrong because he did not make correct assumptions.

Card 1/1

8

69981

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S/020/60/131/05/09/069

AUTHOR: Pliss, V.A.TITLE: Invariant Surfaces of a System of Two Differential Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 131, No. 5, pp. 1022-1024

TEXT: The author considers the system

$$(1) \quad \begin{aligned} \frac{dx}{dt} &= f_1(x, y, t) + \mu R_1(x, y, t, \mu) \\ \frac{dy}{dt} &= f_2(x, y, t) + \mu R_2(x, y, t, \mu), \end{aligned}$$

where  $f_1, f_2, R_1, R_2$  are continuous, in  $t$  they have the period  $\omega$ , and for  $t \in [0, \omega]$  and a sufficiently small  $\mu$  they are uniformly analytic in  $x, y$ . For  $\mu=0$  let (1) have an invariant surface  $M_0$  homeomorphic to the torus.

Under the assumption that the rotation number on  $M_0$  is rational and not all solutions lying on  $M_0$  are periodical, the author proves the existence of an invariant surface  $M_\mu$  of (1) for sufficiently small  $\mu$ . The surface  $M_\mu$  is asymptotically stable. Under additional assumptions on the behavior of the

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Invariant Surfaces of a System of Two  
Differential Equations

S/020/60/131/05/09/069

solutions of (1) for  $\mu=0$  the author proves the smoothness of  $M_\mu$ .

A.A.Andronov, L.S.Pontryagin and A.M.Lyapunov are mentioned in the paper.  
There are 9 references: 4 Soviet, 4 American and 1 French.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet imeni A.A.Zhdanova  
(Leningrad State University imeni A.A.Zhdanov)

PRESENTED: December 18, 1959, by V.I.Smirnov, Academician

SUBMITTED: December 3, 1959

X

Card 2/2

PLISS, V.A.

Families of periodic solutions to systems of differential equations of the second order without dissipation. Dif. urav. 1 no.11:1428-1448 N '65.

(MIRA 18:12)

1. Leningradskiy gosudarstvennyy universitet. Submitted June 21, 1965.

ACC NR: AP7007072

SOURCE CODE: UR/0020/66/168/004/0743/0746

AUTHOR: Linnik, Yu. V. (Academician); Pliss, V. A.; Shalayevskiy, O. V.

ORG: Leningrad Branch, Mathematics Institute im. V. A. Steklov, AN SSSR  
(Leningradskoye otdeleniye Matematicheskogo instituta AN SSSR)

TITLE: Theory of Hotelling's test

SOURCE: AN SSSR. Doklady, v. 168, no. 4, 1966, 743-746

TOPIC TAGS: statistics, mathematics

SUB CODE: 12

ABSTRACT: The problem examined is the verification of the statistical hypothe-

sis of  $H: \xi = 0$  as compared with the (complex) alternative  $H_\delta: N\xi^T \Sigma^{-1} = \delta$ ,

where  $\delta$  is an arbitrary, fixed positive integer. This problem, under certain conditions, is similar to the problem of detecting a signal in noise. In this case the Hotelling  $T^2$  test is usually applied, but so far the properties of the test are enigmatic, and no nontrivial case has been found to which the  $T^2$  test is applicable.

In this paper the investigations of Giri, Kiefer, and Stein (Ann. Math. Stat., Vol 34, 1524 (1963)) are continued and the minimax nature of the  $T^2$  test is proved for the alternative  $H_\delta$  when  $p = 2$ ,  $N = 4$ .

[JPRS: 38,417]

Card 1/1

UDC: 519.251.8



L 6930-66 ENT(d) IJP(a)

ACC-NR: AP5028762

SOURCE CODE: UR/0376/65/001/011/1428/1448

AUTHOR: Pliss, V. A.

44, 55

32  
B

ORG: Leningrad State University (Leningradskiy gosudarstvennyy universitet)

44, 55

TITLE: Families of periodic solutions of the systems of second-order differential equations without dissipation terms

SOURCE: Differentsial'nyye uravneniya, v. 1, no. 11, 1965, 1428-1448

TOPIC TAGS: second order differential equation, second order system, periodic solution existence, periodic solution construction, periodic solutions family

16, 44, 55

ABSTRACT: A study is made of the problem of existence and construction of a family of periodic solutions of a system of second-order differential equations of the form

$$\frac{d^2 x_i}{dt^2} + \lambda_i^2 x_i = g_i(x_1, \dots, x_n) \quad (i = 1, \dots, n), \quad (1)$$

where  $x_i$  are positive numbers and functions  $g_i(x_1, \dots, x_n)$  are given in the form of series in powers of  $x_1, \dots, x_n$  in which constant and linear terms are missing and which converge for sufficiently small  $|x_i|$  values. Only symmetrical periodic solutions of (1) are considered (periodic solutions which satisfy the boundary conditions:  $x_i = x_i(w) = 0, (i = 1, \dots, n)$ . The following three cases are analyzed: 1) when one of the  $\lambda_i$  values is such that it cannot be a multiple of all remaining values ( $\lambda_i \neq m\lambda_1$ ).

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L 6980-66

ACC NR: AP5028762

$i = 2, \dots, n$  and  $n$  is an integer); 2) In the system (1)  $n = 2$  (a system of two equations) and  $\lambda_1 = \lambda_2$ ; 3) when in system (1) some of the values of  $\lambda_i$  are equal and can not be multiples of all remaining values. In the first case, it is shown that an analytic family of symmetric periodic solutions with periods close to  $2\pi/\lambda_1$  exist. In the second and the third cases, conditions are established under which the families of symmetric periodic solutions with periods close to  $2\pi$  exist. Methods for the effective construction of such solutions are presented. Some properties of such families are analyzed. Orig. art. has: 107 formulas. [LK]

SUB CODE: MA/ SUBM DATE: 21Jun65/ ORIG REF: 004/ ATD PRESS: 4143

Cdrd 2/2 *ndo*

L 52512-65 EWI(1) Pg-4 LJP(c)

ACCESSION NR: AF5012016

UR/0376/65/001/001/0017/0024

AUTHOR: Pliss, V. A. 14  
B

TITLE: Existence of a family of periodic solutions for a system of differential equations in the case of zero roots

SOURCE: Differentsial'nyye uravneniya, v. 1, no. 1, 1965, 17-24

TCPIC TAGS: differential equation

ABSTRACT: The author considers

$$\frac{dx}{dt} = Ax + X(x), \quad (1)$$

where the matrix  $A$  has two zero eigenvalues for a non-simple elementary divisor. Here  $x$  is an  $n$  dimensional vector,  $A$  is constant  $n \times n$ , and the components of  $X$  are series in powers of the components of  $x$ , beginning with terms of at least second order. Under certain additional conditions the author proves that there exists a continuous family of (generally nonanalytic) periodic solutions if the system has an integral of a certain special form. Orig. art. has: 47 formulas.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)  
Card 1/2

L 52512-65

ACCESSION NR: AP5012016

SUBMITTED: 03Nov64

ENCL: 00

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SUB CODE: MA

NO REF SOV: 004

OTHER: 000

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Card 2/2

L 4772B-65 EWT(m)/EWP(w) EM

ACCESSION NR AM1017293

BOOK EXPLOITATION

s/ 13  
B+1

Fliss, Viktor Aleksandrovich

Nonlocal problems in the theory of oscillations (Nelokal'nyye problemy teorii kolebaniy), Moscow, Izd-vo "Nauka", 1964, 367 p. biblio. 5,500 copies printed.

TOPIC TAGS: oscillation, mathematics, differential equation, Lyapunov function

TABLE OF CONTENTS (abridged):

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SUBMITTED: 16Mar61

SUB CODE: MA

NO REF SOV: 047

OTHER: 045

TP  
Card 1/1

L 51297-65 ENT(d) Pg-4 IJP(c)

ACCESSION NR: AP5012440

UR/0376/65/001/002/0153/0161

AUTHOR: Pliss, V. A.

TITLE: On the reduction of an analytic system of differential equations to a linear form

SOURCE: Differential'nyye uravneniya, v. 1, no. 2, 1965, 153-161

TOPIC TAGS: differential equations system, differential equation linearization, successive approximations method

ABSTRACT: The possibility of reducing the system of equations

$$\frac{dx_l}{dt} = \lambda_l x_l + f_l(x_1, \dots, x_n) \quad (l = 1, \dots, n), \quad (1)$$

where  $\lambda_l$  are arbitrary complex numbers and  $f_l$  are series in powers of  $x_1, \dots, x_n$  with terms of no order lower than two and convergent in a sufficiently small neighborhood of the origin of coordinates to the linear form

$$\frac{dy_l}{dt} = \lambda_l y_l \quad (l = 1, \dots, n) \quad (2)$$

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L 51297-65

ACCESSION NR: AP5012440

by means of the transformation

$$x_i = y_i + \phi_i(y_1, \dots, y_n) \quad (i=1, \dots, n), \quad (3)$$

where  $\phi_i$  are series in powers of  $y_1, \dots, y_n$  with terms of no degree lower than two and convergent for sufficient small  $|y_i|$  is analyzed. Assuming that the functions  $f_i(x_1, \dots, x_n)$  are such that the construction of formal series of the form (3) is possible, the problem of their construction and their convergence is studied. The function  $\psi(y_1, \dots, y_n)$  is constructed by the method of successive approximations. It is proved that under certain assumptions in respect to  $\lambda_i$ , the selected process of successive approximations converges and there exist analytic functions  $\psi(y_1, \dots, y_n)$  such that transformation (3) reduces system (1) to system (2). Orig. art. has: 54 formulas. [LK]

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: 01Dec64

ENCL: 00

SUB CODE: MA

NO REF SOV: 005

OTHER: 003

ATD PRESS: 3251

859  
Card 2/2

L 41759-65 ENT(d) Pg-4 IJP(c)

ACCESSION NR: AP/042860

UR/0039/64/028/004/0911/0924

AUTHOR: Pliss, V. A.

17

B

TITLE: Study of a transcendental case in the theory of motion stability

SOURCE: AN SSSR. Izvestiya. Seriya matematicheskaya, v. 28, no. 4, 911-924

TOPIC TAGS: differential equation, stability

ABSTRACT: In this work the author completes Lyapunov's study of the stability of the zero solution of the system

$$\left. \begin{aligned} \frac{dx}{dt} &= y + X(x, y, z), \\ \frac{dy}{dt} &= Y(x, y, z), \\ \frac{dz}{dt} &= Az + Z(x, y, z). \end{aligned} \right\} \quad (1)$$

where  $x$ ,  $y$ , and  $t$  are scalar variables,  $z$  is an  $n$ -dimensional vector with components  $z_1, z_2, \dots, z_n$ ,  $A$  is a constant square matrix of  $n$ -th order with elements  $a_{ij}$ , the eigenvalues of the matrix  $A$  have negative real parts, the vector-function  $Z$  has components  $Z_\alpha$ , the functions  $X$ ,  $Y$  and  $Z_\alpha$  are series in powers of  $x, y, z_1, \dots, z_n$ .

Card 1/4



L 41759-65

ACCESSION NR: AP4042860

beginning with terms of not less than second degree. Poincaré introduced the functions  $C(\sqrt{\rho})$  and  $S(\sqrt{\rho})$  as the solution of the system of equations

$$\frac{dC}{d\theta} = -S, \quad \frac{dS}{d\theta} = C^{2n-1} \quad (2)$$

with initial conditions

$$C(0) = 1, \quad S(0) = 0. \quad (3)$$

The change of variables

$$\theta) \quad y = rS(\theta) \quad (4)$$

reduces system (1) to the

$$\left. \begin{aligned} \frac{dr}{dt} &= rR_1(r, s, \theta) \\ \frac{d\theta}{dt} &= r^{-1} \left[ \theta_1(r, \theta) + \theta_2(r, s, \theta) \right] \\ \frac{ds}{dt} &= As + Z(r, s, \theta), \end{aligned} \right\} \quad (5)$$

where the functions  $R_1$  and  $\theta_1$  are series in powers of  $r$  with  $\omega$ -periodic coefficients with respect to  $\theta$ , converging absolutely and uniformly for sufficiently small  $r$  and all  $\theta$ , the functions  $R_2$  and  $\theta_2$  are also series in powers of  $r, s_1, \dots, s_n$ , where  $R_2$  and  $\theta_2$  go to zero for  $s = 0$ , the components  $Z_s$  of the

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vector-function  $\mathcal{Z}$  also are series in powers of  $r, z_1, \dots, z_n$  with coefficients  $\omega$ -periodic in  $\vartheta$ , and these series do not contain terms of lower than second degree in  $r$  and  $z_k$ , and in terms not depending on  $z_k$ , it is involved in a power not lower than  $2q$ . Lyapunov then changed variables once more,

$$\gamma = c(1 + \rho)^{-1} s = c^2 \zeta, \quad (6)$$

where  $c$  is a sufficiently small positive constant, and  $\rho$  is a natural number subject to

$$q \leq \rho \leq 2q - 1. \quad (7)$$

Let  $\zeta_s$  denote components of the vector  $\zeta$ . Substituting (6) into (5) and eliminating  $t$ , one obtains

$$\frac{d\varphi}{d\theta} = cP(c, \rho, \zeta, \theta), \quad c^{\rho-1} \frac{d\zeta}{d\theta} = A\zeta + cF(c, \rho, \zeta, \theta), \quad (8)$$

where  $P$  is a scalar and  $F$  a vector function expanded into series in powers of  $c, \rho, \zeta_s$ ; these series converge absolutely and uniformly for all  $\vartheta$  and sufficiently small  $c, |\rho|$  and  $\|\zeta\|$ . The author introduces the function  $\varphi(c)$  by considering

$$\frac{d\varphi}{d\theta} = cP(c, \rho, \zeta, \theta) + \varphi(c), \quad c^{\rho-1} \frac{d\zeta}{d\theta} = A\zeta + cF(c, \rho, \zeta, \theta), \quad (9)$$

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where  $\varphi(c)$ , given for  $c > 0$ , is chosen such that system (9) for each sufficiently small positive  $c$  has an  $\omega$ -periodic solution  $p = (c, \theta)$ ,  $\zeta = (\zeta_1(c, \theta))$  with initial condition  $\rho_0(c, 0) = 0$ . The case not handled by Lyapunov is solved in the following THEOREM. Suppose there exists a set of positive numbers  $C$  having 0 as its point of accumulation, such that  $\varphi(c) = 0$  for each  $c \in C$ ; then the zero solution of system (5) is stable. Orig. art. has: 66 formulas.

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AUTHOR: Pliss, V. A.

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TITLE: The Reduction Principle in the Theory of Stability of Motion

SOURCE: All SSSR. Izvestiya. Seriya matematicheskaya, v. 28, no. 6, 1964, 1297-1324

TOPIC TAGS: Differential equation, stability theory, asymptotic stability, mathematical physics, reduction principle

ABSTRACT: Consider the system

$$\frac{dx}{dt} = Ax + X(x, y), \quad \frac{dy}{dt} = By + Y(x, y), \quad (0.1)$$

where  $x$  and  $y$  are  $n$ - and  $m$ -dimensional vectors, respectively,  $A$  and  $B$  are  $n \times n$  and  $m \times m$  constant matrices,  $X(x, y)$  and  $Y(x, y)$  are vector functions whose norms are small in comparison with the norms of  $x$  and  $y$ , all eigenvalues of  $A$  are imaginary, and all eigenvalues of  $B$  have negative real parts. The author proves the existence of an invariant surface of the form

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