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Some problems of experimental investigations of....

overall aerodynamic forces on the model; and f) installation for measuring the heat transfer on the model surface. At present, the last two problems were not yet studied. The shock tube was also equipped with an installation measuring the propagation velocity of the shock wave serving as a reference value. This installation was described in Ref. 3 [I. Jakab, A. Zaharescu and L. Dumitrescu: Metodă pentru măsurarea vitezei de propagare a undelor de șoc. Studii și cercetări de mecanică aplicată, XII, 1 (1961), being in publication]. There are 8 figures and 13 references: 6 Soviet-bloc and 7 non-Soviet-bloc. The last five references to the English-language publications read as follows: Ref. 7: Ch.E. Witteliff, M. R. Wilson and A. Hertzberg, The tailored interface shock tunnel. Journal of the Aero-Space Science, 26, 4, April (1959); Ref. 10: J. Gordon Hall, Shock tubes. Institute of Aerophysics University of Toronto, UTIA Review, 12, Part. II, May (1958); Ref. 11: B.D. Henshall, On some aspects of the use of shock tubes for aerodynamic research. R. & M. 3044, London (1957); Ref. 12: B.D. Henshall, Some notes on the use of resistance thermometers for the measurement of heat transfer rates in shock tubes. A.R.C. Techn. Report C.F. 408, London (1959); Ref. 13: B.D. Henshall, Experimental results from the N.P.L. hypersonic shock tunnel. N.P.L. (Aero) 372, February (1959).

SUBMITTED: May 12, 1960

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23661

R/008/60/000/004/014/018  
A125/A126

10.6306

AUTHOR: Procopovici, E.

TITLE: The measuring of mechanical vibrations and shocks by capacitive transducers

PERIODICAL: Studii și Cercetări de Mecanică Aplicată, no. 4, 1960, 1019-1025

TEXT: This paper has been worked out in connection with the measuring of aerodynamic pressures and forces in the shock tube of the Aerodynamical Laboratory of the Institutul de mecanică aplicată (Institute of Applied Mechanics). The author first studies a measuring circuit (Figure 1) and recommends a new scheme which improves and simplifies the performance. The circuit (Figure 1) can not be used in case of low-frequency vibrations, since an increase of the time constant  $\tau = RC$  reduces the signal. Higher time constants can be obtained by the circuit (Figure 2), without increasing the capacity. Thus, the capacity  $C(t)$  will be loaded by the anode battery of the electronic tube, assembled as a cathodic repeater, which guarantees a very high input resistance. The equivalent circuit (Figure 3) can be used for the establishment of the equa-

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tions

$$\rho i_b + R_N i_b + R_k (i_b - i_0) = \varepsilon_b - E_0 + \mu \varepsilon_g, \quad (1)$$

$$\frac{1}{C(t)p} i_0 + R_g i_0 + R_k (i_0 - i_b) = 0, \quad (2)$$

$$\varepsilon_g = - (R_g i_0 - R_N i_b), \quad (3)$$

X

of the recommended arrangement. From the integral equation

$$\frac{1}{C(t)} \int i_0 dt + \left( R_g + R_k + \frac{\mu R_g - R_k}{R_N + \rho} \right) i_0 = \frac{\varepsilon_b - E_0}{\frac{R_k}{R_k} + 1 + \frac{\mu R_N}{R_k}} \quad (4),$$

obtained by eliminating  $i_b$  in (1), (2), (3), the author deduces the solution

$$q = q_0 + \sum_{n=1}^{\infty} \frac{\alpha^n}{\tau_0} \cdot \exp(-t/\tau_0) \int u(t) q_{n-1} \cdot \exp(t/\tau_0) dt. \quad (11)$$

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On the basis of this result he examines two cases, i.e.,  $u(t)$  as a periodic function, and  $u(t)$  as a function with transitory character. a) The general case of a periodic function: Supposing  $u(t)$  to have the shape of

$$u(t) = \sum_{k=0}^{\infty} c_k \sin kpt. \tag{12}$$



the voltage  $v$  at the plugs of the circuit will be expressed by

$$v = R \frac{dq}{dt} = R \left( \alpha I \sum_{k=0}^{\infty} \frac{c_k \sin kpt}{k^2 p^2 \tau_0^2 + 1} - \alpha I \sum_{k=0}^{\infty} \frac{\frac{d}{dt} c_k \sin kpt}{\tau_0 \left( \frac{1}{\tau_0^2} + p^2 k^2 \right)} \right) \tag{14}$$

and on the basis of (12) by

$$\tau_0 \gg 2\pi/p, \quad v \approx \alpha RI \cdot u(t) \tag{15}$$

and

$$\tau_0 \ll 2\pi/k_{\max} p, \quad v \approx \alpha RI \tau_0 \frac{dU(t)}{dt} \tag{16}$$

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The voltage  $v$  is proportional either to the function or with the derivative of the function, depending on the time constant  $\tau_0$ , which is greater or smaller than the period of the phenomenon. b) Transitory function: Supposing  $u(t)$  to be:

$u(t) = \begin{cases} 1 & t > 0 \\ 0 & t < 0 \end{cases}$ , the voltage will be expressed by

$$v = \alpha RI \exp\left(-\frac{1-\alpha}{\tau_0} t\right) \quad (17)$$

and is proportional to the signal, if  $\tau_0 \gg T$ , with a relatively great error

$$\xi = 1 - \exp\left(-\frac{1-\alpha}{\tau_0} T\right) \approx 1 - \exp(-T/\tau_0) \quad (18)$$

$T$  being the useful measuring duration. The relation (18) can be used for the calculation of the necessary time of the input circuit, in function of the admissible error and duration of the necessary time. To increase the time constant, the circuit (Figure 5a) can be used, but the signal obtained is smaller since it is divided by  $R_s$  and the input resistance  $R$ . Replacing the resistor by an electronic tube (Figure 5b), the circuit allows the extension of the method in the field of

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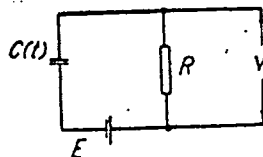
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low frequencies up to 0.1 cps. At high frequencies the method is limited only by the frequency band of the amplifier or transducer used. The results have been used in the development of an apparatus measuring the pressure on the shock tube of the Institute of Applied Mechanics. A membrane-type transducer was used. The measuring circuit was coupled to an "Orion" 1,538" cathode oscillograph and the time intervals were measured by an "Orion" 1,152" impulse generator. There are 6 figures, 1 photo, and 4 references: 2 Soviet-bloc and 2 non-Soviet-bloc. The references to the English language publications read as follows: M. Heteny, Handbook of Experimental Stress Analysis. Ed. John Wiley, New. York, 1950; P. H. Morse, N. Fashbach, Methods of Theoretical Physics. Mc. Graw Hill Book Co., 1950.

SUBMITTED: December 30, 1959

Figure 1: Measuring circuit.



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R/008/60/000/005/013/014  
A231/A126

AUTHOR: Procopovici, E.

TITLE: Capacitive transducers of very low inertia for the detection of shock waves

PERIODICAL: Studii și Cercetări de Mecanică Aplicată, no. 5, 1960, 1293 - 1302

TEXT: The author accomplishes a general analysis of the conditions in which capacitive pressure transducers for the detection of shock waves are operating, and recommends a new transducer with a very short response time. Pressure transducers represent dynamic systems of the 2d order, for which the response time is determined by:  $\tau_r = \alpha/\omega_0$ , (2). In case of temperature transducers which can be represented by 1st-order systems, the time during which the temperature is completely diffused by the active layer of the transducer is given by:  $\tau_d = \frac{\rho c \delta^2}{k}$ , (3), in which  $\rho$  - is the specific mass,  $c$  - the specific heat,  $k$  - the thermal conductivity, and  $\delta$  - the thickness of the metal layer. The first system is characterized by the following sensibility and natural frequency:  $S_1 = \frac{\Delta S}{\Delta p} = \frac{A}{K}$ , (4) and  $\omega_0 = \sqrt{\frac{k}{M}}$ , (5),

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in which  $\Delta p$  - is the pressure effect,  $A$  - the active surface,  $K$  - the elastic constant of the membrane,  $M$  - the membrane's equivalent mass, and  $\omega_0$  - the fundamental pulsation. The product of these two equations:

$S_1 \omega_0^2 = \frac{A}{M}$ , (6) is a value which characterizes the mechanical quality of the system. The separating power is expressed by  $P = \frac{S_1}{\delta_p}$ , (7), in which  $\delta_p$  is

the amplitude of the membrane's displacement [Abstracter's Note:  $\delta_p$  in the denominator of Eq. 7 is probably a missprint and should be  $\delta_p$ ]. The relation

tion  $\frac{M}{A} = \frac{\tau_p}{PS_p} \cdot \frac{1}{(2\pi\alpha)^2}$ , (8) formed of the Eqs. (2), (4), (5) and (7) shows

that the main characteristics of the transducer performance is the mass per unit of active surface. The electric system consists of a plane parallel capacity:  $C = \frac{eA'}{\delta}$ , (9) in which  $e$  - is the dielectric constant,  $\delta$  - the interstice between the armatures, and  $A'$  - the surface of the fixed armature. For small values of the interstice, the relation can be linearized:

$C = \frac{eA'}{\delta} (1 - \frac{\Delta\delta}{\delta})$ , (10) and the error due to the non-linearity can be calculated by  $\zeta \cong (\Delta\delta/\delta)^2$ , (11). The sensibility of the electric system is

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$$S_2 = \frac{\Delta C}{\Delta \delta} = \frac{C}{\delta}, \quad (12)$$
 and of the entire transducer:  $S = S_1 \cdot S_2 = \frac{A}{K} \cdot \frac{C}{\delta}, \quad (13).$ 

The dynamic performance of the pressure transducer can be improved by reducing the mass per surface unit. This reduction, however, leads to a reduction of the membrane rigidity. For the production of a higher frequency, a solution was selected by which the elastic constant of the system does not depend on the mass of the surface unit. The solution consists in transferring the function of elastic support to the dielectric medium. The mobile armature consists of a metal layer, several microns thick, (eventually thermal insulating) deposited on the elastic dielectric which is compressed by the pressure effect. The compression of the dielectric brings the two armatures nearer to each other, thus achieving the capacity variation. The natural frequency is given by:  $\omega_0 = \sqrt{\frac{E/\delta}{M_m + M_d}}, \quad (14)$  in which E - is the dielectric's elasticity module,  $\delta$  - the dielectric's thickness,  $M_m$  - the metal layer's mass, and  $M_d$  - the dielectric's mass. By using as an elastic dielectric a small film of 50 microns and an aluminum film of 2 microns, a 0.7 mc/sec natural frequency can be obtained. Table 1 compares the characteristics of the recommended transducer with that of classical transducers.

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The transducer with a mobile armature consists of an aluminum film fixed on a dielectric support, is used to detect the shock wave in an installation designed at the I.M.A. (Institute of Applied Mechanics). To check the response time of this transducer, the signals produced by the transducer under the action of the shock wave have been oscillographed. For this purpose, the transducer has been installed in a special electronic circuit (Fig. 7). The response time was  $3.5 \mu\text{sec}$ . The signal front is preceded by a front of a low slope. The appearance of this front can be explained by the fact that the warm armature has a great  $b$  dimension in relation to the cold armature, thus the shock wave acts directly on the dielectric. The capacity variation is partially due to the approach of the armatures and partially to the variation of the dielectric constant with the mechanical stress. If the variation law of the dielectric constant in function of the mechanical pressure is linear:  $\epsilon = \eta\sigma + \epsilon_0$ , the material has an  $E$  elasticity module and the brake thickness  $\delta_0$  can be expressed by:  $\epsilon = E(1 - \delta/\delta_0) + \epsilon_0$ , the capacity by  $C = \frac{\eta EA}{\delta} + \frac{\epsilon_0 A}{\delta_0} + \frac{EA}{\delta_0}$ . The sensibility will be  $S_2 = -\frac{C_0 + C_1 \eta}{\delta}$ , in which  $C = \frac{\eta EA}{\delta}$  and  $C_0 = \frac{\epsilon_0 A}{\delta_0}$ . There are 6 figures, 3 photos, 1 table and 10

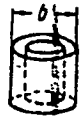

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references: 2 Soviet-bloc and 8 non-Soviet-bloc. The reference to the most recent English-language publication reads as follows: W. W. Willmarth, "Small Barium Titanate Transducer for Aerodynamic or Acoustic Pressure Measurements" Rev. Sci. Inst., 29, 3, 218, March, 1958.

SUBMITTED: December 30, 1959

I Tipul de traductor	$S_1 \frac{E}{b}$	$\frac{M_0}{M}$	$\frac{\omega_0 b}{C_0}$	$\frac{P_{max}}{\sigma_{max}}$	II Observații
	$0,25 \frac{b^3}{h}$	1	2	$2 \frac{h}{b}$	III cuplaj acustic defavorabil
	$0,011 \frac{b^3}{h^3}$	0,6	$12,2 \frac{h}{b}$	$\frac{4}{3} \left(\frac{h}{b}\right)^2$	IV construcție simplă

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10.6300

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D237/0301

AUTHORS: Procopovici, E., and Dumitrescu, L.

TITLE: Measuring aerodynamic pressures in the shock tube

PERIODICAL: Studii și cercetări de mecanică aplicată,  
no. 1, 1961, 185 - 194

TEXT: After briefly analyzing the main problems regarding the measurement of aerodynamic pressures in the shock tube, the authors present a method as well as an apparatus developed at the Institutul de mecanică aplicată (IMA) (Institute of Applied Mechanics) for measuring the pressure in the shock tube constructed at the IMA. Based on investigations conducted at this Institute, the most advantageous pressure indicator proved to be the capacitor type pressure transducer. The pressure indicator mentioned has a survey time of 2-3 sec. To avoid difficulties, the measuring circuit was built on the basis of the d-c polarizing circuits, as shown in Fig. 4. For measuring the pressures in the shock tube, an installa-  
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tion was developed, the block diagram of which is shown in Fig. 5. The electronic signal produced by the transducer, installed in the electronic measuring circuit, is amplified and applied to the vertical deflecting plates of a cathode oscillograph, where the produced image is photographed. A second system is used for retarding the signal produced by the pressure transducer against the release of the time base. This system consists of a membrane contact switch, operated by a shock wave which is propagated through a deflection channel whose length may be varied in such a way that the retardation of the signal should well place the image on the oscillograph's screen. The transducers used are of the classical type with an elastic membrane. The damping of the natural vibrations is accomplished by an air layer located between the membrane and the transducer's lid. The pressure transmission is realized by an orifice located in the transducer's lid. Capacitive transducers with a solid dielectric were also tested. The measuring circuit is accomplished by one half of a 6AR5 tube, while the signal produced by the input circuit is amplified by the other half of the

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6H9C tube. A switch permits the selection of the type of operation. The upper limit of the frequency band transmitted is 50 kc. To measure the pressures at different points, an assembly consisting of 6 channels of the type described above was constructed. During the experiments conducted with only one channel, an "Orion" type 1538 cathode oscillograph was used. First, a number of experiments were conducted to check the reproductive ability and the stability of the method. A detailed analysis of the results obtained proved that the stability and the reproductive ability of the measurements were excellent. The calibration of the measuring installation was accomplished by a dynamic calibration in the shock tube itself. The results of the experiments are shown in Figs. 10a and b, which give the calibration curve in the case of a transducer used with a solid dielectric. This curve presents a linear connection between the pressure and the deflection of the spot on the screen. There are 11 figures and 10 references: 5 Soviet-bloc and 5 non-Soviet-bloc. The four most recent references to the English-language publications read as follows: I. Hall Gordon: Shock tubes.

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R/008/61/000/001/010/011  
D237/D30:

Measuring aerodynamic ...

Utia Review, Institute of Aerophysics University of Toronto, 12, Part I., II., May 1958; Y.T. Li: High frequency pressure indicators for aerodynamic problems. N.A.C.A., TN 3042; W.W. Willmarth: Small Barium Titanate Transducer for Aerodynamic or Acoustic Pressure Measurements. Rev. Sci. Instr., 29, 3, 218, March, 1958; and I. Miklowitz: The Propagation of Compressional Waves in a Dispersive Elastic Rod. Journ. App. Mech., 24, 2, 1957.

Fig. 4.

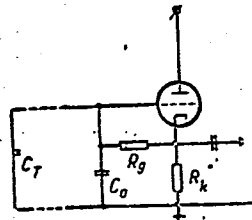


Fig. 4

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RUM/8-59-1-12/24

24.4100

AUTHORS: Manea, V., Procopovici, E.

TITLE: An Extension of the Solution of the Torsion Problem of Some Turbine Blades <sup>26</sup>

PERIODICAL: Studii si Cercetări de Mecanică Aplicată, 1959, Nr 1, pp 203 - 209 (RUM)

ABSTRACT: Studying the bending and the torsion of some turbine blades, Jan Polasek and Ladislav Spacek [Ref 1] give the solution for only a special type of blade shape, obtained by the transformation:

$$z_1 = \left( \frac{1 + \zeta}{2} \right)^\gamma, \quad 0 < \gamma < 1. \quad (1).$$

If  $\gamma = \frac{1}{2}$ , one obtains the Benoulli's lemniscate, which is also treated by N.I. Mesulishviliy [Ref 2]. The authors first consider the functions:

$$z_1 = c_1 \left( \frac{1 + \zeta}{2} \right)^\gamma, \quad 0 < \gamma < 1, \quad (3).$$

which transforms the unity circle into a symmetric biconvex shape, having the dehydral angle equal with  $\gamma\pi$ , and the chord equal with  $c_1$ , and accomplish then the transformation:

$$z = (z_1 - z_0)^m, \quad (4).$$

Card 1/5 In case that  $m = 2$ , the  $Ox_1$  axis is transformed into a parabola (Figure 1).



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## An Extension of the Solution of the Torsion Problem of Some Turbine Blades

Inserting  $y_1 = 0$  in (4), they obtain:

$$x = (\alpha - x_1)^2 - \beta^2, \quad (5)$$

$$\text{and } y = 2\beta(\alpha - x_1) \quad (5')$$

After eliminating they derive the equation of the parabola:

$$x = \frac{y^2}{4\beta^2} - \beta^2, \quad (6)$$

the shape of which is depending on the value selected for  $\beta$ . The  $c_1$  chord of the symmetric biconvex shape is bended and becomes a parabola arc, thus the obtained shape has the chord "c" and the "f" rise given by the formulae:

$$c = c_1 \sqrt{(c_1 - 2\alpha)^2 + 4\beta^2} \quad (7)$$

$$f = \frac{\beta c_1^2}{2} \frac{1}{\sqrt{(c_1 - 2\alpha)^3 + 4\beta^2}} \quad (8)$$

In case of thin shapes, the parabola arc  $\overline{AB}$  represents the shape skeleton, which allows the evaluation of its curving by the relation (8). The corresponding coordinates of the leading and trailing edges can be deter-

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## An Extension of the Solution of the Torsion Problem of Some Turbine Blades

mined by the relations (5) and (5'), by taking for the first  $x_1 = c_1$  and for the latter  $x_1 = 0$ . The resulting shapes have a more evenly distributed thickness along the chord. The tracing of the shapes can be easily accomplished by using the polar coordinates. Choosing the point  $P(x_0)$  named modeling pole (Figure 1), it can be established that if  $z_1 - z_0 = \rho_1 e^{i\tau_1}$ , then on the base of the used transformation (4)  $z$  is:  $z = \rho e^{i\tau} = (z_1 - z_0)^m = \rho_1^m e^{im\tau_1}$ . Thus, the vector radius  $\rho$  of the point " $M_1$ " from the plane " $z_1$ " corresponds in the " $z$ " plane the vector radius  $\rho = \rho_1^m$ , the angles having the relation  $\tau = 2\tau_1$ . The profile can be graphically constructed with all these elements. If  $m > 2$ , the real axis of the  $z_1$  plane is transformed in a curve which can be determined in the same way. If  $m = 3$ , the  $Ox_1$  axis is transformed into a folium of Descartes. Shapes with rounded trailing edges can be obtained on the basis of the transformation (3). A smaller curved radius at the trailing edge can be obtained the smaller  $\delta$  is. Using the transformation (4) in a similar way, shapes of different curvings with rounded trailing edges can be obtained. An approximate method given in [Ref 5] is being used for the solution of the torsion problem of turbine blades having a shape mentioned in subject article.

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An Extension of the Solution of the Torsion Problem of Some Turbine Blades

Starting with a complex function of torsion:

$$f(\xi) = \varphi + i\psi, \tag{10}$$

the authors deduce

$$C_n = \int \frac{|z(\sigma)|^2}{\sigma^{n+1}} d\sigma, \tag{12}$$

and

$$|z(\theta)|^2 = k^2 |z(\theta)|^2 = k^2 \left( \frac{\alpha_0}{2} + \sum_1^{\infty} \alpha_n \cos n\theta + \beta_n \sin \theta \right) \tag{14}$$

which lead to:

$$C_n = k^2 \pi (\beta_n + i\alpha_n), \tag{15}$$

and

$$f(\xi) = \frac{k^2}{2} \sum_0^{\infty} (\beta_n + i\alpha_n) \xi^n \tag{16}$$

The torsion rigidity [Ref 2] expressed by:

$$D = \mu (D_0 + I) \tag{17}$$

in which:

$$D_0 = -\frac{k^4 \pi}{4} \sum_0^{\infty} (\alpha_n^2 + \beta_n^2), \tag{18}$$

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$$I = \frac{k^4}{4} \int_{r_0}^r |z(\tau)|^4 d\tau, \quad (19).$$

The complex effort is determined by the known formula and the angle of specific twisting by the formula:  $\omega = \frac{M_t}{D}$ .

For the practical solution it has been observed that the function  $|z(\theta)|^2$  can be represented graphically.  $|z(\tau)|^4$  necessary for the integration of (19) is also graphically traces. The recommended problem can thus be completely solved. In the present case, the integral equation (12) can be analytically solved, which is reduced to the sum of Euler integrals of the first species.

There are: 3 sets of diagrams and 7 references, 3 of which are Rumanian, 2 English, 1 Russian and 1 Czechoslovakian.

SUBMITTED: October 9, 1958

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(STUDII SI CERCETARI DE MECANICA APLICATA. Vol. 8, no. 1, Jan/Mar. 1957.  
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SO: Monthly List of East European Accessions (EEAL) LC. Vol. 6, No. 12, Dec. 1957,  
Uncl.

"APPROVED FOR RELEASE: 06/15/2000

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APPROVED FOR RELEASE: 06/15/2000

CIA-RDP86-00513R001343110018-9"

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Proper transportation of bacon hogs. p. 15

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Vol. 10, no. 12, Dec. 1958

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Quality of bacon raw material. p. 15

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(Telecommunication) (Afanas'ev, A.P.)

PRODAN, L.; NADUDVARY, Gh.; TARANU, Al.

Effectiveness of wet drilling in prevention of silicosis in miners.  
Rev. igiena microb. epidem., Bucur. no.4:15-22 Oct-Dec 54.

(SILICOSIS

in miners, prev. with wet drilling)

(MINING

silicosis in miners, prev. with wet drilling)

MOGA, A.; PRODAN, L.; PITEA, P.

Role of environmental factors in etiology and pathogenesis of rheumatism; rheumatism in the leather-goods and shoe industry. Probl. reumat., Bucur. 3:81-93 1955.

(OCCUPATIONAL DISEASES

rheum. in leather-goods & shoes indust. workers, etiol.)

(RHEUMATISM

in workers of leather-goods & shoe indust., etiol.)

PRODAN, Laszlo; MAGYAR, Jozsef

Experiences in the manufacture and application of plastic heels.  
Bor cipo 10 no.4:117-120 JI '60.

1. Rakospalotai Bor- es Muanyagfeldogozo Vallalat (for Prodan).
2. Szigetvari Cipogyar (for Magyar).

PRODAN, L.I.; PRODAN, Ye.A.

Conductance and viscosity of the system  $\text{Na}_5\text{P}_3\text{O}_{10} - \text{ZnSO}_4 - \text{H}_2\text{O}$ .  
Izv.vys.ucheb.zav.;khim.i khim.tekh. 5 no.2:340-342 1962. (MIRA 15:8)

1. Chernovitskiy gosudarstvennyy universitet, kafedra fizicheskoy  
khimii.

(Sodium triphosphate) (Zinc sulfate)

PRODAN, L.I.; YERMOLENKO, N.F.

Physicochemical analysis of systems consisting of sodium tripolyphosphate, the soluble salt of a bivalent metal, and water. Dokl. AN BSSR 5 no.10:442-447 0 '61. (MIRA 15:3)

1. Belorusskiy gosudarstvennyy universitet imeni V.I.Lenina.  
(Systems (Chemistry))

YERMOLENKO, N.F. [Iarmolenka, M.F.]; PRODAN, L.I.

Study of cadmium tripolyphosphates based on the physicochemical properties of the system  $\text{Na}_5\text{P}_3\text{O}_{10} - \text{CdSO}_4 - \text{H}_2\text{O}$ . Vestsi AN BSSR. Ser. fiz.-tekh. nav. no. 4:50-55 '62. (MIRA 13:2)

5(2)

SOV/78-4-7-35/44

## AUTHORS:

Prodan, L. I., Prodan, Ye. A.

## TITLE:

An Investigation of the System Sodium Tripolyphosphate - Zinc Sulphate - Water (Issledovaniye sistemy tripolifosfat natriya-sul'fat tsinka - voda)

## PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 7, pp 1663-1666 (USSR)

## ABSTRACT:

In the system mentioned in the title, a precipitate is formed 30 minutes after mixing of the components within the range of concentration of 0.05 - 0.35 mol% at 20° and at 50°, which consists of short prismatic crystals of  $Zn_2NaP_3O_{10} \cdot 9H_2O$  (with a ratio of  $Zn^{2+} : P_3O_{10}^{5-} = 1 : 0$  or  $1 : 1$ ) or (at a ratio of the ions mentioned of  $2 : 1$  or  $1 : 2$ ) of long needle-shaped crystals of  $ZnNa_3P_3O_{10} \cdot 12.5H_2O$ . The ranges in which these precipitations are formed are independent of temperature. The formation of insoluble five times substituted zinc tripolyphosphates according to reference 1, and an amorphous variety of the bisubstituted zinc tripolyphosphate according to ref-

Card 1/2



SOV/78-4-7-35/44

An Investigation of the System Sodium Tripolyphosphate - Zinc Sulphate - Water

erences 5 and 6 was not confirmed. There are 3 figures and  
22 references, 6 of which are Soviet.

SUBMITTED: April 14, 1958

Card 2/2

PRODAN, L. I.; YARMOLENKO, M. F.[Iarmolenka, M. F.]

Sparingly soluble copper, nickel and zinc tripolyphosphates. Vestsi  
AN BSSR. Ser. fiz.-tekh. nav. no.3:63-67 '61.

(MIRA 14:10)

(Copper phosphates)  
(Nickel phosphates)  
(Zinc phosphates)

PRODAN, Laszlo; MAGYAR, Jozsef

Experiences with the manufacture and application of plastic heels. Bor cipo 10 no.4:117-120 J1 '60.

1. Rakospalotai Bor- es Muanyagfeldolgozo Vallalat (for Prodan).
2. Szigetvari Cipogyar (for Magyar).

PRODAN, M., ing.; TOTOLICI, D., ing.; DANCIU, C., conf.; BARBULESCU, D., ing.

Technical and economic considerations on the opportunity of automation introduction in a vegetal oil line. Ind alim veget 13 no.1:11-16 Ja '62.

1. Sectorul proiectari al intreprinderii "Automatica", Bucuresti (for Prodan, Totolici).
2. Institutul de stiinte economice "V.I. Lenin", Bucuresti (for Danciu, Barbulescu).

PRODAN, N.S.

Examination of the melting of the  $\text{NaCl} - \text{KCl} - \text{CaCl}_2 - \text{BaCl}_2$   
salt alloy. Sbor. trud. LIIZHT no.229:177-188 '64.  
(MIRA 18:8)

PROIAN, M. I. VILCHIKOVA, M. I.

examination of welded rail joints performed by the method of  
electric contact welding. Sbor. trud. LIIZHT no.229:23-52 '64.  
(MIRA 18:8)

YERMAKOV, S.S.; PRODAN, N.S.

Methods of measuring impact energy in testing metals for impact  
endurance. Zav. lab. 27 no. 12:1513-1514 '61. (MIRA 15:1)

1. Leningradskiy politekhnicheskii institut im. M.I. Kalinina.  
(Metals--Testing)

AUBERT, H., prof.; STANCIU, L., dr.; PRODAN, P., dr.

Considerations on some rarely encountered ectopic auricular rhythms.  
Med. intern. 14 no.8:909-916 Ag '62.

1. Lucrare efectuata in Clinica I medicala, I.M., Timisoara.  
(ARRHYTHMIA) (ARRHYTHMIA, SINUS)



PRODAN, S.S.

"Isn't the correction factor too high?" Put' i put. khoz. 5 no. 1:30  
Ja '61. (MIRA 14:5)

1. Starshiy dorozhnyy master st. Petrovskoye Selo, Severo-Kavkazskoy  
dorogi.

(Railroads--Track)

PRODAK T

Harvesting in good time is a means for controlling weeds. Zemledelie  
4 no.7:110-112 JI '56. (MIRA 9:9)

1. Akimovskaya nauchno-issledovatel'skaya stantsiya mekhanizatsii sel'-  
skogo khozyaystva.  
(Harvesting) (Weed control)

PRODAN, T.K.

How to destroy Russian centaurea. Nauka i pered. op. v sel'khoz. 7  
no.5:23-24 My '57. (MIRA 10:6)

1. Starshiy nauchnyy sotrudnik Akimovskoy opytnoy stantsii mekhani-  
zatsii sel'skogo khozyaystva.

(Weed control)

AUTHOR: Prodan, T.K., Candidate of Agricultural Sciences <sup>SGV/26-59-2-52/53</sup>

TITLE: Unusual Phenomena in Nature (Neobychnyye yavleniya v prirode)

PERIODICAL: Priroda, 1959, Nr 2, p 127 (USSR)

ABSTRACT: The author and A.A. Krivtsov, the book-keeper of the kolkhoz imeni I.V. Stalin in the Genicheskiy rayon of Khersonskaya oblast', asked the editors of this journal to explain the phenomenon of cylindrical and conic snow rolls of various sizes formed by the action of the wind. The editors answered that this rare phenomenon has also been observed in the Antarctic by Amundsen. It comes into being when, at an air temperature slightly above 0°C, new friable snow falls on the solid surface of old snow that had been subject to thawing. The wind tears tufts off the new snow and whirls them across the plain. Hereby cylindrical and conic snow rolls are formed.

Card 1/2

Unusual Phenomena in Nature

SOV/26-59-2-52/53

Individual snow rolls of over 1 m in length have been observed but are extremely rare. Generally the rolls are very small. There are 3 photographs.

ASSOCIATION: Akimovskaya opytnaya stantsiya - Zaporozhskaya oblast' (Akimovka Experimental Station - Zaporozhskaya Oblast')

Card 2/2

PRODAN, T.K. Cand Agr Sci -- (diss) "Weedy plants of the southern  
steppe of the Ukrainian SSR and basic agricultural engineering  
measures to combat them." [Kiev], 1957. 16 pp. (Min Agr UkSSR.  
Ukrainian Acad Agr Sci). 100 copies.  
(KL, 8-58, 107)

-46-

PRODAN, T.K., kand.sel'skokhozyaystvennykh nauk

Unusual natural phenomenon. Priroda 48 no.2:127 P '59.

(MIRA 12:3)

1. Akimovskaya opytnaya stantsiya, Zaporozhskaya oblast'.  
(Akimovka District--Snow)

PRODAN, T. K.

Heterogeneity of the seeds of *Salsola ruthenica* Iljin and their morphological characteristics. *Agrobiologiya* no.5:151-152 S-0 '56. (MLRA 9:11)

1. Akimovskaya opytnaya stantsiya mekhanizatsii sel'skogo khozyaystva.  
(*Salsola*) (Seeds)



PRODAN, V.T.

Problem of active relaxation in the muscular activity of man.  
Vest. LGU 17 no.9:134-137 '62. (MIRA 15:5)  
(RELAXATION)

PRODAN, V.V. (g.Ishin)

Work practices in laying water pipelines under railroads. Vol.  
i san. tekhn. no.11:34-35 N '60. (MIRA 13:11)  
(Water pipes)

AUTHOR: Prodan, Ye. A. SOV/78-3-12-24/36

TITLE: Investigation of the System Sodium Tripolyphosphate - Nickel Sulfate - Water (Issledovaniye sistemy tripolifosfat natriya - sul'fat nikelya - voda)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1958, Vol 3, Nr 12, pp 2757-2763 (USSR)

ABSTRACT: The interaction reactions between sodium tripolyphosphate and nickel sulfate in aqueous solutions were investigated by measuring the electrical conductivity and the viscosity of the isomolar and heterogeneous mixtures. The limit of the heterogeneous regions in this system was determined for the concentration range 0.05-0.35 mole% of salts at 20° and 50°. Precipitation occurs at concentrations above 0.15 mole %. The amount of precipitate was determined by the method of I. W. Tananayev. When the ratio of  $\text{Ni}^{2+} : \text{P}_3\text{O}_{10}^{5-} = 1 : 1$  the amount of precipitate is maximal, and with the ratios of  $\text{Ni}^{2+} : \text{P}_3\text{O}_{10}^{5-} = 1 : 2$  and  $\text{Ni}^{2+} : \text{P}_3\text{O}_{10}^{5-} = 5 : 2$  no precipitate appears. The precipitate in the heterogeneous region consists of needle-

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SOV/78-3-12-24/36

Investigation of the System Sodium Tripolyphosphate - Nickel Sulfate - Water

like prismatic crystals with the uniform composition  $\text{NiNa}_3\text{P}_3\text{O}_{10} \cdot 12\text{H}_2\text{O}$ . Amorphous impurities were not found in these crystals. Using the method of Thilo (Tilo) it was found that the compound produced is not  $\text{Ni}_2\text{NaP}_3\text{O}_{10}$  but the compound  $\text{Ni}_5(\text{P}_3\text{O}_{10})_2 \cdot 17\text{H}_2\text{O}$ . It was found that  $\text{NiNa}_3\text{P}_3\text{O}_{10} \cdot 12\text{H}_2\text{O}$  is produced when the ratio  $\text{Ni}^{2+} : \text{P}_3\text{O}_{10}^{5-} \approx 3 : 2$ . This compound dissolves in sodium tripolyphosphate to form  $\text{Ni}(\text{Na}_4\text{P}_3\text{O}_{10})_2 \cdot 17\text{H}_2\text{O}$ . The formation of this compound was confirmed by measuring the electrical conductivity. The determination of the viscosity at  $20^\circ$  and  $50^\circ\text{C}$  appeared to be a simple and easy physico-chemical method for determining unknown compounds. There are 6 figures, 2 tables, and 11 references, 7 of which are Soviet.

SUBMITTED:

August 16, 1957

Card 2/2

PAVLYUCHENKO, M.M., akademik; PRODAN, Ye.A.

Role of chemical and crystallization processes in reversible  
topochemical reactions. Dokl. AN SSSR 136 no. 3:651-653 Ja '61.  
(MIRA 14:2)

1. Belorusskiy gosudarstvennyy universitet imeni V.I. Lenina.
2. Akademiya nauk BSSR (for Pavlyuchenko).  
(Crystallization) (Chemical reactions)

PRODAN, Ye. A.; PAVLYUCHENKO, M. M.

"Crystallization reactions in the thermal decomposition of solid materials."

Report to be submitted for the 5th Intl. Symposium on the Reactivity of Solids (IUPAC), Munich, West Germany, 2-8 Aug 1964.

Inst for General & Inorganic Chemistry, AS BSSR, Minsk.

PRODAN, L.I.; PRODAN, Ye.A.

Conductance and viscosity of the system  $\text{Na}_5\text{P}_3\text{O}_{10} - \text{ZnSO}_4 - \text{H}_2\text{O}$ .  
Izv.vys.ucheb.zav.;khim.i khim.tekh. 5 no.2:340-342 162.  
(MIRA 15:8)

1. Chernovitskiy gosudarstvennyy universitet, kafedra fizicheskoy  
khimii.

(Sodium triphosphate) (Zinc sulfate)

PRODAN, Ye.A.

Investigation of the sodium tripolyphosphate-nickel sulfate-water  
system. Zhur.neorg.khim. 3 no.12:2757-2763 D '58. (MIRA 12:1)  
(Sodium phosphates) (Nickel sulfates) (Systems (Chemistry))



SOV/78-4-7-35/44

5(2)

AUTHORS:

Prodan, L. I., Prodan, Ye. A.

TITLE:

An Investigation of the System Sodium Tripolyphosphate - Zinc Sulphate - Water (Issledovaniye sistemy tripolifosfat natriya-sul'fat tsinka - voda)

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 7, pp 1663-1666 (USSR)

ABSTRACT:

In the system mentioned in the title, a precipitate is formed 30 minutes after mixing of the components within the range of concentration of 0.05 - 0.35 mol% at 20° and at 50°, which consists of short prismatic crystals of  $Zn_2NaP_3O_{10} \cdot 9H_2O$  (with a ratio of  $Zn^{2+} : P_3O_{10}^{5-} = 1 : 0$  or  $1 : 1$ ) or (at a ratio of the ions mentioned of  $2 : 1$  or  $1 : 2$ ) of long needle-shaped crystals of  $ZnNa_3P_3O_{10} \cdot 12.5H_2O$ . The ranges in which these precipitations are formed are independent of temperature. The formation of insoluble five times substituted zinc tripolyphosphates according to reference 1, and an amorphous variety of the bisubstituted zinc tripolyphosphate according to ref-

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An Investigation of the System Sodium Tripolyphosphate - Zinc Sulphate - Water SOV/78-4-7-35/44

ferences 5 and 6 was not confirmed. There are 3 figures and 22 references, 6 of which are Soviet.

SUBMITTED: April 14, 1958

Card 2/2

PRODAN, Ye. A.

Category: USSR / Physical Chemistry  
Thermodynamics. Thermochemistry. Equilibrium. Physico-  
chemical analysis. Phase transitions.

B-8

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29953

Author : Pamfilov A. V., Prodan Ye. A.

Inst : not given

Title : Investigation of the System Tripolyphosphate of Sodium-Copper  
Sulfate - Water.

Orig Pub: Ukr. khim. zh., 1956, 22, No 4, 427-433

Abstract: Determination, at 20 and 50°, of specific electric conductivity and viscosity of the system  $\text{Na}_5\text{P}_3\text{O}_{10}$  -  $\text{CuSO}_4$  -  $\text{H}_2\text{O}$  in the concentration interval of salt mixture 0.05 - 0.35 mol.% (at different ratios of salts). The formation was discovered, and the boundaries of occurrence were determined, of the compounds  $\text{Cu}_5(\text{P}_3\text{O}_{10})_2$ ,  $\text{CuNaP}_3\text{O}_{10}$ ,  $\text{Cu}(\text{Na}_4\text{P}_3\text{O}_{10})_2$ . Of these the last mentioned is described for the first time. Inaccuracies have been found in literature data.

Card : 1/1

*Chemistry State-73 - Univ. State Phys. Chem.*

*Prodan, Yu.*

4-1-4/19

AUTHOR: Prodan, Yu., Scientific Worker of the State Institute of  
~~Astronomy~~ imeni Shternberg

TITLE: Attention, Here Comes Sputnik! (Vnimaniye, idët sputnik!)

PERIODICAL: Znaniye - Sila, 1958, # 1, pp 11 - 12 (USSR)

ABSTRACT: The author describes the methods and instruments utilized to observe the first Earth satellite at an observatory headed by A.S. Sharov, and attached to the Astronomical Institute imeni Shternberg.

AVAILABLE: Library of Congress

Card 1/1

PAVLYUCHENKO, M.M., red.; PRODAN, Ye.A., red.

[Heterogeneous chemical reactions] Geterogennye khimicheskie reaktsii. Minsk, Nauka, i tekhnika, 1965. 200 p.  
(MIRA 18:11)

PRODAN, Ye.A.; PAVLYUCHENKO, M.M.; DERBINSKIY, I.A.

Figures of thermal decomposition on mercury oxide crystals.  
Dokl. AN BSSR 9 no.9:585-587 S '65. (MIRA 18:11)

1. Belorusskiy gosudarstvennyy universitet imeni Lenina.  
Submitted April 8, 1965.

PAVLYUCHENKO, M.M.; SLYSHKINA, S.A.; PRODAN, Ye.A.

Thermal stability of natural and synthetic manganese carbonates.  
Dokl. AN BSSR 9 no.6:379-382 Je '65. (MIRA 18:9)

1. Institut obshchey i neorganicheskoy khimii AN BSSR.

PRODAN, Ye.A. [Proden, I.A.A.]; PAVLYUCHENKO, M.M. [Pauliuchenka, M.M.]

Effect of the solid product of the reaction on the mechanism  
underlying the thermal decomposition of cadmium carbonate.  
Vestsi AN BSSR. Ser. fiz.-takh. nav. no.4342-49 '62. (MIRA 1844)



PRODAN, Ye.A.; PAVLYUCHENKO, M.M.

Etch and decomposition figures and an increase of the rate of  
reactions proceeding with the participation of solids. Dokl. AN  
BSSR 7 no.11:760-763 II '63. (MIRA 17:9)

1. Institut obshchey i neorganicheskoy khimii AN BSSR.

*10-11-58*  
PRODAN, Yu., nauchnyy sotrudnik

Attention, there comes the Sputnik! Znan. sila 33 no.1:11-12  
Ja '58. (MIRA 11:2)

1.Gosudarstvennyy actronomicheskiy institut im. Shternberga.  
(Artificial satellites)

23691

S/035/61/000/004/020/058  
AG01/A101

3.12.58  
AUTHORS

Prodan, Yu. I.; Galikova, T. I., and Neaterov, V. V.

TITLE: Results of preliminary investigations of the zenith telescope of the Moscow Observatory, GAISH

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 4, 1961, 17, abstract 4A215 ("Tr. 14-y Astrometr konferentsii SSSR, 1958". Moscow-Leningrad, AN SSSR, 1960, 276-283. Discus. 283, Engl. summary)

TEXT: A new home-made zenith telescope ZTL-180 (ZTL-180) was mounted in GAISH in 1957. The pavilion and foundation of the instrument are described, as well as small changes made in its design to eliminate some defects. The observational program includes 119 pairs and 25 zenith stars the visual magnitudes of which are within the range from 6<sup>m</sup>.5 to 9<sup>m</sup>.0. Observations are conducted from dawn to dawn. The results of determining the main instrumental constants are described. Periodic and micrometer advance screw errors were investigated by means of a special ocular with cobweb filaments; scale division of Talcott levels was determined on a Hildebrandt testing device by A. S. Vasil'yev's methods; the value of one micrometer screw revolution was obtained from observa-

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23691

S/035/61/009/004/020/058  
AG01/A101



Results of preliminary investigations ...

tions of wide scale pairs. It is noted that the investigations carried out, as well as the first observations with the instrument, revealed its good qualities. The root-mean-square errors in one determination of latitude turned out to be equal to  $\pm 0''16$ .

N. Andreyenko

[Abstractor's note: Complete translation]

Card 2/2

RYKHLOVA, L.V.; PRODAN, Yu.I.

Value of the screw turn of the ocular micrometer of the zenith  
telescope at the Moscow Observatory. Soob. GAISH no.134:33-36  
'64. (MIRA 17:8)

PRODAN, B.I.

Variations of the latitude of Moscow during the International Geophysical Year and International Geophysical Cooperation by observations with the Moscow zenith telescope. Soob. GAISH no.134:3-16 '64. (MIRA 17:8)

PRODAN, Yu. I.

Brief news. Astron. tsir. no.229:37-38 Je '62. (MIRA 16:6)  
(Earth—Rotation)

PRODAN, Yu.I., brigadir autochnoy kompleksnoy brigady

New equipment calls for new work organization. Ugol' Ukr.  
5 no.12:33-34 D '61. (MIRA 14:12)

1. Shakhta "Kommunist-Novaya" tresta Oktyabr'ugol'.  
(Coal mines and mining—Labor productivity)



PRODAN, Yu.I.; NESTEROV, V.V.

Determining the value of an ocular micrometer screw revolution  
in the ZT-180 zenith telescope. Astron. tsir. no.193:17-19  
Jy '58. (MIRA 12:1)

1. Gosudarstvennyy astronomicheskiy institut im. P.K.Shternberga.  
(Micrometer) (Telescope, Zenith)

PRODAN, Yu. I.

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PHASE I BOOK EXPLOITATION

007/5742

Akademiya nauk SSSR. Nauchnoissledovatel'skiy komitet po provedeniyu Nauchnoissledovatel'skogo geofizicheskogo goda. VIII razdel programy IIG: Shiroty i dolgoty.

Predvaritel'nyye rezul'taty issledovaniy kolebaniy shirot i dvizheniya polusov zemli; sbornik statey (Preliminary Data of Latitude Variations and Migrations of the Earth's Poles; Collected Articles. No. 1) Moscow, Izd-vo AN SSSR, 1960. 97 p. Errata slip inserted. 1,000 copies printed.

FOURCE: This collection of articles is intended for astronomers, geophysicists, and other scientists concerned with the problem of latitude variations and the migration of the Earth's poles.

COVERAGE: Part I of the collection contains preliminary results of latitude observations from 1957.5 through 1959.0 made at IGY stations in the USSR network, including new stations in Siberia. Part II consists of articles describing new instruments, observational programs and methods, and procedures of processing the latitude observational data. With the larger number of stations and the use of new instruments it is anticipated that the final results will provide a more comprehensive study of anomalies and instrumental

Card 1/5

Preliminary Data of Latitude Variations (Cont.)

307/5742

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errors in latitude observations than has been possible previously. No personalities are mentioned. English abstracts and references follow each article.

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Romanukhina, S. V., L. D. Kostina, and N. R. Andreyenko. Latitude Observations at the Main Astronomical Observatory of the Academy of Sciences USSR (Freyberg-Mondrat'yev Zenith-Telescope)

7

Yevtushenko, Ye. I., I. P. Gogorodnik, and O. V. Chaprunova. Observations of Talcott Pairs at the Poltava Geometrical Observatory of the Ukrainian Academy of Sciences (Zeiss Zenith-Telescope)

9

Popov, H. A. Observations of Bright Zenith Stars at the Poltava Geometrical Observatory of the Ukrainian Academy of Sciences (Zeiss Zenith-Telescope)

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Preliminary Data of Latitude Variations (Cont.)

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Card 4/5

PRODAN, Yu. I.

PHASE I BOOK DESCRIPTION:

SCI/5721

Vsesoyuznaya astronomicheskaya konferentsiya.

Trudy 14-y Astronomicheskoy konferentsii SSSR, Kiyev, 27-30 maya 1958 g.  
(Transactions of the 14th Astronomical Conference of the USSR, held in Kiyev  
27-30 May 1958) Moscow, Izd-vo AN SSSR, 1969. 480 p. Errata slip inserted.  
1600 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Glavnaya astronomicheskaya observatoriya  
(Pulkovo).

Resp. Ed.: M. S. Zverev, Corresponding Member, Academy of Sciences USSR; Ed. of  
Publishing House: N. K. Zaychik; Tech. Ed.: R. A. Zharayeva.

PURPOSE: The book is intended for astronomers and astrophysicists, particularly  
those interested in astronomical research.

COVERAGE: This publication presents the Transactions of the 14th Astronomical  
Conference of the USSR, held in Kiyev 27-30 May 1958. It includes 27 reports  
and 55 scientific papers presented at the plenary meeting of the Conference

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Transactions of the 14th Astronomical (Cont.)

SGV/5721

and at the special sectional meetings. An appendix contains the resolutions adopted by the Conference, the composition of the committees, the agenda, and the list of participants at the Conference. A brief summary in English is given at the end of each article. References follow individual articles. The Presidium of the Astronomical Committee (Chairman M. S. Zverev), which supervised the preparation of this publication, expresses thanks to the members of the secretariat: V. M. Vasil'yev, I. G. Kol'chinskii, A. B. Onegina, and Kh. I. Potter.

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Address by A. A. Mikheylov, Chairman of the Astronomical Council of the Academy of Sciences USSR

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REPORTS OF THE ASTRONOMICAL COMMITTEE AND SUBCOMMITTEES  
INFORMATION ON ASTRONOMICAL WORK PRESENTED BY VARIOUS INSTITUTIONS

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1. Dnepropetrovskiy meditsinskiy institut epidemiologii, mikro-  
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POSPELOV, G.L., starshiy nauchnyy sotrudnik; LAPIN, S.S.; BELOUS, N.Kh.;  
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3. Zapadno-Sibirskiy filial Akademii nauk SSSR (for Vakhrushev, Pospelov.)
4. Zapadno-Sibirskoye geologicheskoye upravleniye (for Sakovich).
5. Krasnoyarskoye geologicheskoye upravleniye (for Pan).
6. Zapadno-Sibirskiy geologo-razvedochnyy trest Chernetrazvedka (for Prodanchuk).
7. Sibirskiy geofizicheskiy trest (for Pipar).
8. Vsesoyuznyy geologicheskiy nauchno-issledovatel'skiy institut (for Dodin).
9. Gornaya ekspeditsiya (for Mitropol'skiy).
10. Gornoye upravleniye Kuznetskogo metallurg.kombinata (for Lukin).
11. Tomskiy politekhnicheskiy institut (for Zimin).
12. Sibirskiy metallurg.institut (for Korel').
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