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Selected Bibliography of Statistical Literature 1930 to 1957: VI. Theory of Estimation and Testing of Hypotheses, Sampling Distributions, and Theory of Sample Surveys

This is the sixth in a series of bibliographies that deal with various specific subjects in the field of statistics. Given here are approximately sixteen hundred references and titles to important publications dealing with the theory of statistical estimation and testing of hypotheses (parametric case), sampling distributions, and the theory of sample surveys.

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(May 22, 1962)

The purpose of any bibliography is to provide a search of the literature for students in a particular field of investigation. This series provides such a service in several of the specific subjects within the very large field of probability and mathematical statistics. Search of the literature in this case has been of a parasitic nature, however, in that two prominent reviewing journals have been used for our source material. Abstracts of original papers appearing in a myriad of technical journals throughout the world and in many languages, have been transferred from the reviewing journals to cards which form a collection of statistical material maintained on a current basis in the NBS Statistical Engineering Laboratory. *Zentralblatt für Mathematik* was used for this purpose from 1930 to 1939; *Mathematical Reviews* has been used from 1940 onward. The abstracts have been coded into categories of subject matter following generally, but with some minor deviations, the classification scheme of *Mathematical Reviews*. One abstract may be classified under several subjects; hence may appear in more than one place in this series of bibliographies. The references given in these published bibliographies were transcribed from the abstracts by means of punched cards thereby necessitating severe and unconventional abbreviations in many cases. The titles were added as each bibliography was compiled.

The present bibliography is a composite of several areas in statistics because of the unusual amount of straddling here. In addition to the papers listed by the reviewing journals directly under these subjects, we have also combed through those classified by *Mathematical Reviews* under the more general headings *General Statistics* and *Statistical Tests and Related Topics*. Papers dealing solely with ranking and paired-comparison techniques, order statistics, and other distribution-free methods have been excluded for the most part, in view of the thorough and extensive coverage of these areas by Savage's [1] latest bibliography of nonparametric statistics.

The abstracting services of both *Zentralblatt für Mathematik* and *Mathematical Reviews* have favored papers and books on theory and methodology rather than applications. Therefore, we do not claim completeness, especially in the more practical aspects of statistics. This becomes particularly evident in the field of sample surveys. Furthermore, there does not seem always to be a clear distinction between writings dealing with sampling in the sense of the theory and methodology of sample surveys and those dealing with sampling distributions of particular functions of sample values in successive random samples of fixed size from a specified probability distribution.

Because of the overlapping nature of the material included in this bibliography, we have made no effort at subclassifying the references.

The organization of information within each entry is:

Author: The author's surname, followed by initials only. In the case of multiple authorships, the journal reference appears with each author's name, but the title of the paper appears with the first author only. The symbol ♦ preceding the surname denotes multiple authorship.

Title: Exactly as in the reviewing journal. Titles of separately bound publications (books, reports, theses, etc.) are in italics, followed by the publisher.

Reference to literature: The name of the journal in italics, the number of the volume in bold face, the initial page number, and the date of publication in parentheses comprise the reference to the original article.

Reference to the abstract: The final symbols M (for *Mathematical Reviews*) and Z (for *Zentralblatt für Mathematik*) are followed by the volume number and page number of the reviewing journal in which the abstract appears.

[1] I. Richard Savage, *Bibliography of Nonparametric Statistics* published by the Harvard University Press, Cambridge, Mass., 1962. This is a much extended version of his earlier *Bibliography of Nonparametric Statistics and Related Topics*, J. Amer. Statist. Assoc. Vol. 48, pp. 844–906, December 1953.

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(Paper 66B3–80)

JOURNAL OF RESEARCH of the National Bureau of Standards—B. Mathematics and Mathematical Physics
Vol. 66B, No. 3, July–September 1962

Publications of the National Bureau of Standards *

Selected Abstracts

Derivation of the relaxation spectrum representation of the mechanical response function, R. S. Marvin, *J. Research NBS* **66**A (*Phys. and Chem.*) *No. 4 (July–Aug. 1962).*
Relaxation spectra have been used in both the presentation and interpretation of measurements of the mechanical properties of rubberlike polymers.

Analysis of coaxial two-terminal conical capacitor, M. C. Selby, *NBS Mono. 46, April 6, 1962, 20 cents.*
Adjustable capacitors having electrodes in the form of coaxial cones or frustums have been used on rare occasions in the past; but their potential superiority to other types of capacitors for some important applications have been overlooked. The advantage of this geometry over cylindrical or disk forms is that the practical capacitance range is several times larger. An example cites the capacitance ranges of a disk, cylindrical, and conical type to be 10, 40, and 168 to one, respectively. An approximate equation was derived for this conical capacitor and close agreement is shown between computed and measured values of capacitance versus electrode displacement. Multiple cone and different shape electrodes are suggested to obtain large values of capacitance with an appreciable saving of space and further increased range of capacitance. The electric field is plotted and its construction steps for axial symmetry are given.

Evaluation of convolution integrals occurring in the theory of mixed path propagation, J. R. Johler and C. M. Lilley, *NBS Tech. Note 132 (PB161633) (1961) $1.00.*
The theory of propagation of electromagnetic waves around a sphere treats the smooth homogeneous case, i.e., the case in which the surface impedance of the sphere is uninterrupted by an abrupt change in conductivity such as a land/sea boundary. It is known, however, that such a theory can be extended to treat inhomogeneous, irregular terrain by formulating certain convolution integrals which utilize the smooth homogeneous formulas. The evaluation of these integrals can be accomplished with dispatch on a large-scale electronic computer with the aid of numerical analysis techniques.
The particular case of a land/sea boundary in a smooth, spherical surface is illustrated for a variety of cases by evaluating the convolution integrals on a large-scale computer.

Displacement and strain-energy distribution in a longitudinally vibrating cylindrical rod with a viscoelastic coating, P. Hertelendy, *J. Appl. Mechanics, No. 61–WA–30 (1962).*
A numerical solution by R. M. Davies of the Pochhammer frequency equation is used to determine the displacement and strain-energy distribution across the cross section of an infinite elastic circular cylindrical rod for a number of wave lengths of the first, second and third modes of symmetrical longitudinal wave propagation. With these results the effect of a thin uniform layer of viscoelastic material is investigated. The four viscoelastic parameters of the coating are reduced to one in the definition and computation of upper and lower bounds of the loss factor, and the application of results to experimental work is discussed.

A string language for symbol manipulation based on ALGOL 60, J. H. Wegstein and W. W. Youden, *Commun. ACM* **5**, *No. 1, 54–61 (Jan. 1962).*
An artificial computer programming language is proposed for describing the manipulation of strings of characters and symbols. The concept of strings, introduced in the ALGOL 60 Report, is extended by adding: (1) the declaration of strings, substrings, and string arrays with explicit lengths; (2) the ability to concatenate and shift strings; and (3) the ranking of symbols for comparing strings in Boolean relations. A primer or informal description of the language is followed by examples, a description of experiments with the language on an IBM 704 computer, and a formal description which, taken with the ALGOL 60 Report, defines the proposed string language.

Statistical problems arising in the establishment of physical standards, W. J. Youden, *Proc. Fourth Berkeley Symp. on Math. Statistics and Probability III, 321–335 (1961).*
The establishment and maintenance of physical standards is indispensable for scientific research, commerce, and industry. The first standards were sufficiently ahead of the existing needs so that questions of precision and accuracy were hardly raised. In recent years the requirements of research and industry have become extremely exacting. Questions of precision and accuracy are now raised on every hand.
Among the statistical problems connected with the development of improved physical standards are the estimation of measurement precision; the design of experiments to provide information on the accuracy; and the reconciliation of results obtained in the national laboratories of the countries undertaking this work. This paper reviews and illustrates by actual examples, some of the ways in which statistical methodology can make contributions in this field.

A lattice with an unusual frequency spectrum, R. J. Rubin and R. Zwanzig, *J. Math. Phys.* **2**, *No. 6, 861–864 (Nov.-Dec. 1961).*
The lattice is a special rooted Cayley tree, generated by N successive m-fold branchings. With each point of the tree are associated a mass M and a position coordinate x_i. All end points are held fixed at $x_i=0$. The potential energy is $V=\frac{1}{2}\sum_{i,j} K_{ij}(x_i-x_j)^2$, where $K_{ij}=K$ if i and j are connected neighbors and neither is an end point, $K_{ii}=\alpha K$ if i and j are connected neighbors and either is a branch tip point, and $K_{ij}=0$ if i and j are not connected neighbors. The allowed frequencies of vibration are obtained for two different cases: In the first case all springs are identical ($\alpha=1$), and in the second case the springs connecting interior points to the branch tips are cut ($\alpha=0$). In the case in which all force constants are the same, the allowed frequencies of vibration, in the limit of infinite, N, are given by $\omega(r)=(K/M)^{\frac{1}{2}}[m+1-2m^{\frac{1}{2}}\cos r\pi]^{\frac{1}{2}}$, where r is any rational number between zero and one. The fraction of all normal modes having precisely the value $\omega(r)$ is $\rho[\omega(r)]=(m^q-1)^2/(m^q-1)$, where r is expressed as the ratio $r=p/q$ of relatively prime integers p and q. The frequency spectrum is dense within the interval $(m^{\frac{1}{2}}-1,\ m^{\frac{1}{2}}+1)$; and $\rho[\omega]$ is discontinuous at every ω for which it does not vanish.

A new approach to the mechanical syntactic analysis of Russian, I. I. Rhodes, *Mech. Transl.* **6**, *33–50 (Nov. 1961).*
This paper categorically rejects the possibility of considering a word-to-word conversion as a translation. A true translation is unattainable, even by the human agent, let alone by mechanical means. However, a crude *practical* translation is probably achievable. The present paper deals with a scheme for the syntactic integration of Russian sentences.

Congruences for the partition function to composite moduli, M. Newman, *Illinois J. Math.* **6**, *No. 1, 59–63 (Mar. 1962).*
The principal result proved is that the unrestricted partition function $p(n)$ fills all residue classes modulo 65 infinitely often. Similar results are proved.

The shape of the geomagnetic field boundary under uniform external pressure, R. J. Slutz, *J. Geophys. Research* **67,** *No. 2, 505–513 (Feb. 1962).*

A solution is given for the shape of the cavity which separates the earth's magnetic field from the interplanetary plasma, for a model which assumes the plasma pressure to be constant over the surface of the cavity (thus giving axial symmetry). It is seen that along the polar axes there are cusps extending inward which reduce the cavity size along these axes to $\frac{2}{3}$ of the size in the equatorial plane. Applying these results as an approximation in the earth-sun direction for the non-axially-symmetric case of solar wind gives an estimate of about 9 earth radii for the distance of the boundary from the earth's center in the direction of the sun.

Inequalities for the permanent function, M. Marcus and M. Newman, *Ann. Math.* **75,** *No. 1, 47–62 (Jan. 1962).*

By exhibiting the permanent function as an inner product on a suitably defined space of tensors on a unitary space, many inequalities and bounds for the permanent are obtained. Thus it is shown that if the $n \times n$ matrix A is symmetric positive semi-definite and doubly stochastic, then

$$\text{per } A \geq \frac{n!}{n^n}$$

with equality if and only if A is the matrix with entries all $\frac{1}{n}$. Another result shown is that if U is a unitary matrix, then

$$|\text{per } U| \leq 1$$

with equality if and only if U is a generalized permutation matrix.

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Journal of Research 66A (Phys. and Chem.) No. 4 (July–Aug. 1962), 70 cents.

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Thermal conductivity of gases. II. Thermal conductivity of carbon dioxide near the critical point. L. A. Guildner.

Derivation of the relaxation spectrum representation of the mechanical response function. R. S. Marvin. (See above abstract.)

Intermediate phases in superconducting niobium-tin alloys. L. L. Wyman, J. R. Cuthill, G. A. Moore, J. J. Park, and H. Yakowitz.

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