

NEWS AND NOTICES

Readers are invited to submit to the Treasurer of the Institute news items of interest.

Personal Items

Professor Lincoln E. Moses has recently become chairman of the Department of Statistics at Stanford University, succeeding Professor Herbert Solomon.

Professor Henry Scheffé has recently become chairman of the Department of Statistics at the University of California at Berkeley, succeeding Professor Lucien LeCam.

New Members

- Adegboyega, Oluwole, B.Sc.**, (London University); Graduate Student, Imperial College, London University: 8, *Edenhurst Avenue, London, S.W.6.*
- Bezuszka, Stanley J.**; Chairman, Department of Mathematics, Boston College.
- Esberger, Sven Erik, Pol. Mag.**, (University of Stockholm); Pol. Mag., Institute of Statistics, Stockholm; *Sikvågen 23, Tyreso, Sweden.*
- Frey, Merle E., M.B.A.** (New York University); Supervisor, Supply Programming Department, Shell Oil Company, 50 W. 50th Street, New York, New York 10020.
- Ghosh, Jayanta Kumar, D.Phil.**, (Calcutta University); Assistant Professor, Department of Mathematics, University of Illinois, on leave from Calcutta University.
- Girone, Giovanni, Laurea in Economia e Commercio**, (University of Bari); Assistant of Statistics/Professor of Anthropometry, University of Bari; *Via Abate Gimma, 23-Bari, Italy.*
- Goerke, Alfred R., M.Sc.**, (Rutgers—State University of New Jersey); Reliability Engineer, RCA, Route 202, Somerville, New Jersey.
- Goldstein, Harvey, B.Sc.**, (Manchester University); Lecturer in Statistics, Institute of Child Health, Great Ormond Street, London, W.C.1.
- Hayakawa, Takesi**, (Nagoya University); Research-worker/Statistician, Institute of Statistical Mathematics, 1 Azabu Huzimi-tyo, Minato-ku, Tokyo, Japan.
- Holst, Lars, B.Sc.**, (Lund University, Sweden); Assistant, Department of Mathematical Statistics, Lund University of Technology.
- Kemp, C. D.**, Diploma in Statistics, (Oxford University); Senior Lecturer in Statistics/Head of Department of Statistics, The Queen's University of Belfast.
- Khazanie, Ramakant G., Ph.D.**, (Purdue University); Assistant Professor, Department of Mathematics, Western Illinois University.
- Krishnan, Marakatha, Ph.D.**, (Madras University); Officer-in-Charge, Indian Statistical Institute, Madras/Research Associate (1964–1966), Division of Mathematical Statistics, State University of New York at Buffalo; *605 B. Allenhurst, Buffalo, New York 14226.*
- Larson, Kenneth E., M.S.I.E.**, (Lehigh University); Senior Research Engineer, Engineering Research Center, Western Electric Co., P.O. Box 900, Princeton, New Jersey.
- MacNeill, Ian Bruce, M.A.**, (Queen's University, Kingston); Graduate Student, Department of Statistics, Stanford University; *85D Escondido Village, Stanford, California.*
- Norman, James E., Jr., Ph.D.**, (Virginia Polytechnic Institute); Assistant Professor, Department of Statistics, University of Massachusetts.
- Nwaku, Godwin O.**, West African School Certificate; Statistical Assistant, Ministry of Economic Planning, Enugu; *Private Mail Bag 1018, Enugu, Nigeria.*
- Patterson, Dan W., M.Sc.**, (University of Pennsylvania); Graduate Student, Rutgers—

- State University of New Jersey/Member of Technical Staff, Bell Telephone Laboratories, Holmdel, New Jersey; *R.R.1, Clover Hill Road, Colts Neck, New Jersey 07722*.
- Polfeldt, Thomas**, B.Sc., (University of Lund, Sweden); Assistant, Department of Mathematical Statistics, Lund University.
- Raghunandan K.**, M.Sc., (University of Kerala, India); Graduate Student, Statistical Laboratory, Colorado State University.
- Singh, Rajinder**, Ph.D., (University of Illinois); Visiting Assistant Professor, Department of Mathematics, University of Illinois.
- Spjøtvoll, Emil**, Cand. Real., (University of Oslo); Cand. Real., Teaching in Department of Mathematics, University of Oslo.
- Suzuki, Giitiro**, Master Course, (Tôhoku University, Japan); Research-worker/Statistician, Institute of Statistical Mathematics, 1 Azabu Huzimi-tyo, Minato-ku, Tokyo, Japan.
- Swain, Donald D.**, M.S., (Stanford University); Graduate Student, Department of Statistics, Stanford University; *3102 Fresno Street, Santa Clara, California 95051*.

REPORT OF THE LINCOLN, NEBRASKA MEETING OF THE INSTITUTE OF MATHEMATICAL STATISTICS

The one-hundred-fourth meeting of the Institute of Mathematical Statistics, the Central Regional Meeting was held at the University of Nebraska in Lincoln, Nebraska, on April 1-2, 1965.

A total of fifty-five people registered for the meetings.

Program

Thursday, April 1, 1965

10:20 a.m.-12:00 a.m.—Invited Papers I

Chairman: J. STAPLETON, Michigan State University

1. *Approximation to Probability Distributions*, M. M. SIDDIQUI, Colorado State University.
2. *On a Two-way Channel with Memory*, J. BIRCH, University of Iowa.

1:30 p.m.-3:15 p.m.—Invited Papers II

Chairman: S. SAMUELS, Purdue University

1. *Two-period Experiments*, K. R. SHAH, Michigan State University.
2. *On a Class of Multivariate Test Criteria*, K. C. S. PILLAI, Purdue University.
3. *On Models and Hypotheses*, R. HOGG, University of Iowa.

3:30 p.m.-5:00 p.m.—Contributed Papers I

Chairman: E. CROW, National Bureau of Standards

1. *Repetitive Play in Finite Statistical Games with Unknown Distributions*, J. VAN RYZIN, Argonne National Laboratory.
2. *A class of Ranking and Selection Procedures*, D. M. MAHAMUNULU, University of Minnesota.
3. *An Optimum Solution of a Three-Decision Problem Involving Classification*, A. KUDÔ, Kyushu University and Iowa State University, and K. SAKAGUCHI, Kyushu University.
4. *On Some c-sample Nonparametric Tests for Location in the Behrens-Fisher Situation*, P. V. RAMACHANDRAMURTY, Case Institute of Technology.
5. *The Compound Weibull Distribution*, S. DUBEY, Procter and Gamble Co.

Friday, April 2, 1965

9:00 a.m.—10:00 a.m.—Contributed Papers II

Chairman: M. NEUTS, Purdue University

1. *Multivariate Continuous Parameter N -ple Markov Processes* (Preliminary Report), V. S. MANDREKAR, University of Minnesota.
2. *On Orthogonal Arrays of Strength Four* (Preliminary Report), E. SEIDEN and R. ZEMACH, Michigan State University.
3. *A Test for Monotonicity of the Dose-Response Curve in Bioassays* (Preliminary Report), P. LEAVERTON, University of Iowa.

10:20 a.m.—12:00 a.m.—Invited Papers III

Chairman: R. HOGG, University of Iowa

1. *Some Results on Small Deviation Probability Convergence Rates for Sums of Random Variables*, C. C. HEYDE, Michigan State University.
2. *Imbedded Semi-Markov Processes in Queues*, M. F. NEUTS, Purdue University.
3. *The Problem of Convergence Rates in the Law of Large Numbers for Weighted Sums of Independent Random Variables*, D. L. HANSON, University of Missouri.

1:30 p.m.—3:15 p.m.—Invited Papers IV

Chairman: I. WEISS, University of Colorado

1. *Asymptotic Properties of the Likelihood Ratio*, T. S. PITCHER, Lincoln Laboratory, M.I.T.
2. *Probability, Its Role in Fiducial Inference*, J. S. WILLIAMS, Colorado State University.

3:30 p.m.—5:00 p.m.—Invited Papers V

Chairman: J. BIRCH, University of Iowa

1. *Convergence Rates for Linear Combinations of Certain Dependent Random Processes*, L. H. KOOPMANS, University of New Mexico.
2. *Asymptotic Value Distributions for Certain $k \times n$ Games and n -Stage Games of Perfect Information*, D. R. THOMAS and H. T. DAVID, Iowa State University.
3. *A Mendelian Markov Process with Multinomial Transition Probabilities*, R. G. KHAZANIE, Western Illinois University.

Contributed Papers by Title

1. *Characterizations of Normal and Generalized Truncated Normal Populations Using Order Statistics*, Z. GOVINDARAJULU, Case Institute of Technology.
2. *Tables of Percentage Points of the Multivariate t Distribution*, P. KRISHNAIAH and J. ARMITAGE, Aerospace Research Laboratories.
3. *On Some Multisample Permutation Tests Based on a Class of U -Statistics*, P. SEN, University of California, Berkeley.
4. *Compound Gamma, Beta and F Distributions*, S. DUBEY, Procter and Gamble Co.
5. *Some Results on Tests for Poisson Processes*, P.A.W. LEWIS, IBM, San Jose Research Laboratory.
6. *The Estimation of the Parameter in the Stochastic Model for Phage Attachment to Bacteria*, R. SRIVASTAVA, Michigan State University.
7. *A Group Testing Problem* (Preliminary Report), S. KUMAR, University of Minnesota.

SHANTI S. GUPTA
Associate Secretary

REPORT OF THE TALLAHASSEE, FLORIDA MEETING OF THE INSTITUTE OF MATHEMATICAL STATISTICS

The one hundred fifth meeting of the Institute of Mathematical Statistics was held at Florida State University, Tallahassee, Florida, on April 29, 30 and May 1, 1965. This meeting was held jointly with the Biometric Society (ENAR) and with the Section on Physical and Engineering Sciences and the Biometrics Section of the American Statistical Association.

A total of 279 persons registered for the meetings. Of this number, 139 were members of the Institute.

Program

Thursday, April 29, 1965

9:45 a.m.—Concepts and Applications Involving Ranked Data

Chairman: R. A. BRADLEY, Florida State University

1. *Multivariate Scaling Methods*, J. KRUSKAL, Bell Telephone Laboratories, Inc.
2. *Graphs & Paired Comparison Rankings*, W. A. THOMPSON, Florida State University.
3. *The Curve Through the Expected Values of Ordered Variates and Applications*, J. G. SAW, Virginia Polytechnic Institute.

Discussants: R. ABELSON and J. AUMON, Yale University.

9:45 a.m.—Contributed Papers I

Chairman: K. PETTIGREW, National Institute of Mental Health

1. *Principles for Ranking Independent Variables by Order of Importance in the General Linear Hypothesis Model*, K. ABT, U. S. Naval Weapons Laboratory (Introduced by V. CHEW).
2. *Bayes Sequential Design in the Two-Action Case*, R. BOHRER, Research Triangle Institute and University of North Carolina.
3. *Effects of Sampling Frequency on Estimates of Regression Parameters When Correlation Among Errors is Ignored* (Preliminary Report), V. CHEW, RCA Service Company, Patrick AFB.
4. *Approximations to the Maximum Likelihood Estimator Using Grouped Data*, B. K. KALE, Iowa State University.
5. *A Chi Square Decision Procedure Using Prior Information*, W. E. LEVER, Florida State University.
6. *Measures of Dispersion*, A. M. MATHAI, MCGILL University.

1:00 p.m.—Stochastic Processes

Chairman: K. CHOI, Cornell University

1. *An Analysis of Various Aspects of the Infectious Process*, T. WILLIAMS, Duke University.
2. *The Path Coefficient Method Considered as a Method of Studying Certain Types of Markov Chains*, O. REIERSOL, University of Oslo and Cornell University.
3. *The Martin Boundary for a Random Walk*, P. NEY and F. SPITZER, Cornell University.
4. *Adaptive Statistical Procedures in Reliability and Maintenance Problems*, J. L. GASTWIRTH, Johns Hopkins University and J. H. VENTER, Potchefstroom University.

3:00 p.m.—Sequential Procedures

Chairman: H. A. DAVID, University of North Carolina at Chapel Hill

1. *A Bayesian Test for Some Classical Null Hypotheses with Applications to Sequential Clinical Trials*, J. CORNFIELD, National Heart Institute.
2. *Some Sequential Designs Useful for Acceptance Sampling*, M. H. MYERS and M. SCHNEIDERMAN, National Cancer Institute.
3. *Some Short-Cut Methods in Sequential Testing of Hypotheses*, B. K. GHOSH, Lehigh University.

3:00 p.m.—Regression Procedures for Missile Trajectory Estimation

Chairman: C. L. CARROLL, Pan American World Airways, Patrick AFB

1. *Discussion of Statistical Techniques Used in Trajectory Estimation*, W. T. WELLS, Wolf Research and R. L. ANDERSON, University of North Carolina at Raleigh.
2. *Minimum Variance Trajectory Estimation and Systems Analysis*, N. BUSH, Pan American World Airways/GMRD, Patrick AFB.
3. *Recursive Estimation with Applications to Trajectory Problems*, R. W. SITTNER, ARCON Corp.
4. *Recursive Estimation of Variances in Trajectory Estimation*, D. B. DUNCAN, Johns Hopkins University and A. W. RINALDI, RCA Service Company, Patrick AFB.

Friday, April 30, 1965

8:00 a.m.—Bioassay

Chairman: J. E. GRIZZLE, University of North Carolina at Chapel Hill

1. *Sequential Experiments in Bioassay*, M. DAVIS, Johns Hopkins University.
2. *Allocating Observations in a Parallel Line Assay*, J. R. BOEN, University of Minnesota.
3. *The Design of Quantal Assays of Potency*, B. W. BROWN, JR., University of Minnesota.

Discussant: R. ELSTON, University of North Carolina at Chapel Hill.

8:00 a.m.—Contributed Papers II

Chairman: J. BARTKO, National Institute of Mental Health

1. *Some Remarks on the Lomax Paper*, S. D. DUBEY, The Procter and Gamble Company.
2. *A Bayes Approach for Combining Correlated Estimates*, S. GEISSER, National Institute of Arthritis and Metabolic Diseases.
3. *Asymptotic Variances and Covariances of Maximum-Likelihood Estimators, from Censored Samples, of the Parameters of Weibull and Gamma Populations*, H. L. HARTER and A. H. MOORE, Wright-Patterson Air Force Base.
4. *On Sequential Multinomial Estimation*, A. KUDŌ, Kyushu University and Iowa State University and A. OKUMA, H. YAMATO and T. YANAGAWA, Kyushu University.
5. *A Randomization Test for Equality of Means of Two Multivariate Populations with Common Covariance Matrix* (Preliminary Report), K. M. PATEL and R. A. BRADLEY, Florida State University.
6. *K-Sample Analogous to Rényi's Kolmogorov-Smirnov Type Theorems*, M. CSÖRGŐ, Princeton University.

10:30 a.m.—Problems in Regression Analyses

Chairman: R. L. ANDERSON, University of North Carolina at Raleigh

1. *Some Problems in Regression Analysis with Missing x Values*, R. R. HOCKING, Texas A&M University.

2. *Exact Confidence Regions for Parameters in Nonlinear Regression Laws*, H. O. HARTLEY and L. D. BROEMELING, Texas A&M University.

10:30 a.m.—Contributed Papers III

Chairman: E. YEN, Catholic University

1. *Small Sample Power for the One-Sample Wilcoxon Test for Non-Normal Shift Alternatives*, H. J. ARNOLD, Bucknell University.
2. *Lattice Paths, Kolmogorov-Smirnov Statistics and Compositions*, S. G. MOHANTY, McMaster University.
3. *A Simple Proof of the Conservative Character of the Wilcoxon Procedures in the Discrete Case*, G. E. NOETHER, Boston University.
4. *Conditional Distributions of Renewals*, D. L. BENTLEY, Pomona College and B. J. PROCHASKA, Clemson University.

1:30 p.m.—Recent Developments in the Theory of Stochastic Processes

Chairman: I. R. SAVAGE, Florida State University

1. *Identically and Independently Distributed Stochastic Sums and Integrals*, E. LUKACS, Catholic University.
2. *Stochastic Differential Equations*, R. SYSKI, University of Maryland.
3. *Some Peculiar Semi-Markov Processes*, W. L. SMITH, University of North Carolina at Chapel Hill.

1:30 p.m.—Compound and Mixed Distributions

Chairman: S. K. KATTI, Florida State University

1. *Some Properties of Compound Distributions of Type $g_1g_2(z)$* , J. SINGH and S. K. KATTI, Florida State University.
2. *Applications of Discrete and Continuous Mixed Distributions*, K. SUBRAHMANYAM, University of Western Ontario.
3. *Certain Characteristic Properties of Multivariate Discrete Probability Distributions Akin to the Bates-Neyman Model in the Theory of Accidents*, G. P. PATIL, Pennsylvania State University.
4. *Identifiability of Countable Mixtures of Discrete Probability Distributions Using Methods of Infinite Matrices*, G. P. PATIL, Pennsylvania State University and S. BILDIKAR, McGill University.

3:30 p.m.—Variance Components

Chairman: S. R. SEARLE, Cornell University

1. *A Bayesian View of the Circumstance in which the Usual Unbiased Estimate of a Variance Component is Negative*, B. M. HILL, Harvard University.
2. *On the Estimation of the Intra-Class Correlation Coefficient*, D. L. WEEKS and J. D. TESTERMAN, Oklahoma State University.
3. *Two-Step Estimation of the Treatment Variance Component in a Two-Level Design*, A. WEISS, American Cyanamid Co., and R. L. ANDERSON, University of North Carolina at Raleigh.

3:30 p.m.—Contributed Papers IV

Chairman: D. A. MEETER, Florida State University

1. *Classification of Binary Random Patterns*, K. ABEND, Philco Applied Research Laboratory and L. KANAL, Philco Applied Research Laboratory and University of Pennsylvania.

2. *The Variance of the Number of Zeros of a Stationary Normal Process*, J. D. CRYER and M. R. LEADBETTER, Research Triangle Institute.
3. *Functions of Finite Markov Chains*, F. W. LEYSIEFFER, Florida State University.
4. *On Stochastic Approximation Processes*, M. T. WASAN, Queen's University.
5. *Solutions to Some Two-Sided Boundary Problems for Sums of Variables with Alternating Distributions*, G. YEO, Yale University and J. CHOVER, University of Wisconsin.
6. *Relationships Between Values and Measures of Information*, M. BEHARA, University of Waterloo, Ontario, Canada.

Saturday, May 1, 1965

8:00 a.m.—Recent Developments in Nonparametric and other Robust Methods

Chairman: W. A. THOMPSON, Florida State University

1. *Performance of Different Robust Estimators of Location*, P. BICKEL, University of California, Berkeley.
2. *Sequential Analysis in Rank Order Problems*, I. R. SAVAGE, Florida State University and L. J. SAVAGE, Yale University.
3. *Asymptotic Normality in Nonparametric Methods*, K. JOGDEO, Courant Institute of Mathematical Sciences.
4. *Nonparametric Estimation and Testing in Linear Models*, M. PURI, Courant Institute of Mathematical Sciences.

Discussant: E. LASKA, New York University

8:00 a.m.—New Applications in Fractional Factorials

Chairman: W. T. FEDERER, Cornell University

1. *Generalization of the Construction and Analysis of Fractional Replicates*, B. L. RAKTOE, Cornell University.
2. *On the use of Fractional Factorials to Construct Smallest Designs for Quadratic Response Surfaces*, W. S. CONNOR, Texas A&M University.
3. *On a Special Subset Giving an Irregular Fractional Replicate of a 2^n Factorial Experiment*, K. S. BANERJEE, Kansas State University.
4. *2^{n-q} Plans Robust Against Linear and Quadratic Trends*, C. DANIEL, New York City and F. WILCOXON, Florida State University.

10:00 a.m.—Multivariate Analysis

Chairman: H. O. HARTLEY, Texas A & M University

1. *Asymptotic Expansions in Multivariate Statistics*, G. A. ANDERSON, Yale University.
2. *Covariance Structures and Their Applications for the Testing of Models*, R. E. BARGMANN, IBM Components Division.

10:00 a.m.—Mathematical Models in Biology

Chairman: H. L. LUCAS, University of North Carolina at Raleigh

1. *On the Ergodic Properties of the Tracer System*, P. BERGNER, Oak Ridge Institute of Nuclear Studies.
2. *Tension Versus Stretch Relations from Plethysmograph Records*, H. M. LIEBERSTEIN, University of Indiana.
3. *A Mathematical Model for the Incorporation of Radio-Orthophosphate into the DNA of Granulocytes*, W. M. O'FALLON, University of North Carolina at Chapel Hill.

Contributed Papers by Title

1. *A Compound Generalized Extreme Value Distribution*, S. D. DUBEY, The Procter and Gamble Company.

2. *A Characterization of the Negative Exponential Distribution*, Z. GOVINDARAJULU, Case Institute of Technology and University of California, Berkeley.
3. *The Hyperbolic Secant Distribution*, W. L. HARKNESS and M. L. HARKNESS, Pennsylvania State University.
4. *On the Bivariate Moments of Order Statistics from a Logistic Distribution and Applications*, B. K. SHAH, Yale University (Introduced by F. J. ANSCOMBE).
5. *A Test for Goodness of Fit for a Continuous Distribution*, V. P. GODAMBE, Dominion Bureau of Statistics (Introduced by B. K. KALE).
6. *Effect of Non-Normality on Two-Sided Variables Sampling Plans and Two Sided Tolerance Limits which Control Percentages in Both Tails of the Normal Distribution* (Preliminary Report), J. N. K. RAO and D. B. OWEN, Graduate Research Center of the Southwest.
7. *Missing Values in Multivariate Statistics*, R. ELASHOFF, University of California, Berkeley.
8. *Semifolding 2^{n-k} Designs*, P. W. M. JOHN, University of California, Davis.
9. *A Class of Wide-Sense Markov Processes*, C. B. MEHR, International Business Machines Corporation.

SAMUEL W. GREENHOUSE
Associate Secretary

LIFE TESTING AND SYSTEMS RELIABILITY AND MAINTAINABILITY OCTOBER 18-29, 1965

A two-week course in Life Testing and Systems Reliability and Maintainability will be conducted by New York University on October 18-29, 1965. The principal lecturers will be Dr. Benjamin Epstein, a statistical consultant associated with the theory and application of life testing and reliability; Dr. Frank Proschan, a member of the Mathematics Research Laboratory of Boeing Scientific Research Laboratories, a researcher in the mathematical theory of reliability. Fee for the course is \$300. For further information write: Office of Special Services to Business and Industry, New York University, New York, New York 10003.

TOPICS IN LIFE TESTING INCLUDE

The Poisson process and probabilistic failure models
 Life test sampling plans and estimation procedures when the life distribution is exponential.
 Truncated sequential life tests
 Tests for exponentiality
 Life test sampling plans and estimation procedures for non-exponential life distributions such as the Weibull and Gamma
 Nonparametric life test procedures
 Robustness considerations
 Bayesian methods in life testing and reliability

TOPICS IN SYSTEMS RELIABILITY AND MAINTAINABILITY INCLUDE

Failure distributions possessing a monotone hazard rate
 Renewal theory and its application to the design of optimum maintenance, repair, and checking policies.
 Markov and semi-Markov processes and their applications to the reliability and availability of repairable systems
 Spares provisioning
 Redundancy optimization and related topics