$0 \leq q \leq 1$. (3) $x_1 \leq 0$, $x_n \geq 0$, $q \leq 0$, culminating in the general case: (4) $-\omega_1 \leq x_1 \leq x_n \leq \omega_2$, $-\omega_2/\omega_1 \leq q < \infty$. The common procedure in the first three cases is to integrate out the extreme from the joint distribution of one extreme and the extremal quotient. Geometric considerations give the appropriate regions of integration. The general case is obtained by a composition of cases (3), (2), and (1). For symmetrical initial distributions there exist only two branches which join at $q = 1$, and the probability function may be written in a symmetrical form. When $n = 2$, the distribution of q for a symmetrical distribution is symmetrical about zero and invariant under a reciprocal transformation, and if the initial distribution possesses no moments and does not vanish at $x = 0$, the density of probability becomes infinite at $q = 0$. The distribution of q is not affected by changes in scale but is very sensitive to changes in origin. For a uniform distribution, the extremal quotient of a nonnegative variate has just the opposite qualities of the extremal quotient of a nonpositive variate. For variates changing sign, the extremal quotient is asymptotically negative.

31. **The Distributions of the t and F Statistics for a Class of Nonnormal Populations.** RALPH A. BRADLEY, Virginia Polytechnic Institute.

Series expansions of the cumulative distribution functions of t and of F in powers of t^{-1} and F^{-1} are obtained. The general method of derivation presented is valid for populations with density functions, $f(u)$, such that $f(u) > 0$, $f(u)$ is continuous, and has continuous derivatives for all values, $-\infty < u < \infty$. The coefficients of terms in these expansions are reduced from integrals, of multiplicity equal to the sample size, to products of coefficients, common to all populations of the class defined above, and integrals of no greater multiplicity than the number of groups of observations in the sample. Selected values of the common coefficients are given as well as illustrative examples for the Cauchy and "squared hyperbolic secant" population.

32. **Note on the Behavior of the Characteristic Function of a Random Variable at Zero.** M. ROSENBLATT, University of Chicago.

Let X be a random variable with characteristic function $\phi(z)$. Let $X_n = X$ when $|X| < n^{1/\alpha}$ and let $X_n = 0$ when $|X| \geq n^{1/\alpha}$. The following theorems are proved: (1) $1 - \phi(z) = o(|z|^\alpha)$, $0 < \alpha < 1$, at $z = 0$ if and only if $n \cdot Pr(|X| > n^{1/\alpha}) = o(1)$. (2) $1 - \phi(z) = o(|z|^\alpha)$, $1 \leq \alpha < 2$, at $z = 0$ if and only if $n \cdot Pr(|X| > n^{1/\alpha}) = o(1)$ and $E(X_n) = o(1)$. The results are obtained by making use of W. Feller's necessary and sufficient conditions for the weak law of large numbers (see W. FELLER, *Acta Univ. Szeged*, Vol. 8 (1937), pp. 191–201).

NEWS AND NOTICES

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

Personal Items

Dr. R. R. Bahadur, who received his Ph.D. in mathematical statistics from the University of North Carolina in June, 1950, is now an instructor in the Committee on Statistics of the University of Chicago.

Dr. T. A. Bancroft, Associate Professor of Statistics, Iowa State College, has been appointed Head of the Department of Statistics and Director of the Statistical Laboratory at Iowa State College.

Dr. Geoffrey Beall, formerly with the Research Laboratory of Swift & Co., Chicago, Illinois, has accepted a professorship in statistics in the Department of Mathematics, University of Connecticut, Storrs.

Dr. Archie Black has resigned his position as government statistician to devote more time to his work as Treasurer and Mathematical Consultant with the Mechanical Research Corporation of Chicago.

Professor David Blackwell of Howard University has been appointed Visiting Professor of Statistics at Stanford University for 1950–51.

Mr. Nils Blomqvist of the University of Stockholm has been appointed as Instructor in Mathematics and Statistics at Boston University for the academic year of 1950–51.

Professor Roque G. Carranza has started a course of twelve lectures on fundamentals of probability and statistics at Colegio Libre de Estudios Superiores in Buenos Aires which is a private nonprofit institution for higher studies.

Dr. Andrew L. Comrey, formerly an Assistant Professor of Psychology at the University of Illinois, has accepted a position as Assistant Professor of Psychology and Public Administration, Department of Psychology, University of Southern California, Los Angeles.

Dr. D. R. Cowan, who has been conducting many research projects for the coal industry and for various steel, food, paint, appliance, oil and other companies, has been appointed Professor of Marketing in the School of Business Administration, University of Michigan, Ann Arbor.

Dr. Robert E. Greenwood has been recalled to active duty by the Navy Department and is on leave from the Department of Applied Mathematics of the University of Texas.

Dr. Leo A. Goodman, who was a Social Science Research Council Research Training Fellow in the Mathematical Statistics Section of Princeton University, is now an Assistant Professor teaching statistics in the Sociology Department of the University of Chicago.

Mr. W. C. Hoffman is a thesis fellow at the Institute for Numerical Analysis during 1950–51.

Professor Paul Horst has returned to the Department of Psychology, University of Washington, Seattle. He took a year's leave of absence during 1949–1950 to be Director of Research in the Educational Testing Service at Princeton, New Jersey.

Dr. Stanley L. Isaacson, who was a Naval Research Assistant at Columbia University, has been appointed Assistant Professor of Statistics in the Statistical Laboratory at Iowa State College, effective September, 1950, where he will be employed in research and teaching. Dr. Isaacson spent last summer working as a Mathematical Statistician with the Operations Research Office in Washington, D. C.

Dr. Allyn W. Kimball has resigned his position as Experimental Statistician at the USAF School of Aviation Medicine, Randolph Air Force Base, and will be on the Mathematics Panel at the Oak Ridge National Laboratory.

Mr. William Kruskal is now associated with the Committee on Statistics at the University of Chicago.

Professor E. L. Lehmann is on leave of absence from the University of California, Berkeley, for the academic year 1950–51. He is teaching at Columbia University during the first semester and at Princeton University the second.

Mr. Garnet McCreary was awarded at the Commencement June 15, 1950, the degree of Doctor of Philosophy in Statistics at Iowa State College. His dissertation was entitled "Cost Functions for Sample Surveys." He has been appointed Assistant Professor in the Department of Mathematics, University of Manitoba, Winnipeg, Canada, effective September 1950, where he will be employed in teaching, consulting and research.

Professor William B. Michael, who held the position of Assistant Professor of Psychology at Princeton University for the past three years, accepted an appointment as Associate Professor of Psychology at San Jose State College commencing September, 1950.

Dr. Stanley W. Nash, formerly Associate in Mathematics at the University of California, Berkeley, has accepted an appointment as Assistant Professor of Mathematics and Research Consultant in Statistics at the University of British Columbia at Vancouver, effective July 1, 1950.

Dr. H. W. Norton has resigned as statistician of the Accountability Branch of the Atomic Energy Commission to become Professor of Agricultural Statistics in the Illinois Agricultural Experiment Station and the University of Illinois.

Dr. A. E. Paull, formerly biometrician for the Grain Research Laboratory, Board of Grain Commissioners, Winnipeg, Canada, has accepted a position as Associate Statistician in the Department of Statistical Research, Abitibi Power & Paper Company, Limited, Toronto, Canada.

Dr. Paul Peach, formerly Associate Professor at the Institute of Statistics, University of North Carolina, is now head of the Data Analysis Branch, Test Department at the Naval Ordnance Test Station, China Lake, California.

Dr. Raymond P. Peterson, formerly a research fellow at the Institute for Numerical Analysis, National Bureau of Standards, Los Angeles, received his doctorate from University of California at Los Angeles in June and has accepted a position as Instructor of Mathematics at the University of Washington, Seattle.

Dr. P. Ratoosh, formerly a lecturer at Columbia University, is now an Instructor in the Department of Psychology at the University of Wisconsin.

Mr. Joseph S. Rhodes has accepted a position as Mathematical Statistician in the office of the United States Air Force Comptroller, Washington, D. C. He is acting in the capacity of Mathematical Advisor to the Director of Statistical Services on the design of sample surveys.

Miss Rosemary Savey has accepted a position as Instructor in Statistics and Research Assistant in the Bureau of Business Research, University of Toledo.

Dr. Esther Seiden, formerly lecturer and research fellow at the University of California, Berkeley, accepted an assistant professorship in the Department of Statistics, School of Business Administration, University of Buffalo, New York.

Abraham Wald

Abraham Wald, a Fellow of the Institute, and Mrs. Wald were killed in a plane crash in India on December 13, 1950. Professor Wald was born in Cluj, Romania, October 31, 1902. His academic training was received at the University of Cluj (L.M., 1927) and the University of Vienna (Ph.D., 1931). He was a research associate of the Austrian Institute for Business Cycle Research until 1938 when he came to the United States. He had since been associated with Columbia University, becoming Professor of Mathematical Statistics and Executive Officer of the Department of Mathematical Statistics. Professor Wald made important contributions to the fields of mathematical statistics and probability, pure mathematics, and mathematical economics. He had written almost 100 papers in these fields as well as two books, *Sequential Analysis* and *Statistical Decision Functions*.

Professor Wald had been a president of the Institute, a member of the Council of the Institute and of the Editorial Board of the *Annals*, a vice-president and Fellow of the American Statistical Association, and a Fellow of the Econometric Society.

Statistics Summer Session at Virginia Polytechnic Institute

The Department of Statistics, Virginia Polytechnic Institute, will hold a special summer session August 8–25, 1951, for graduate students, research workers, and technicians in government and industry. Special emphasis will be given to statistics in economics and engineering. Several visiting professors will participate in the lecturing. For details write to the Department of Statistics, Virginia Polytechnic Institute, Blacksburg, Virginia.

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The following Ph.D. degrees with major in mathematical statistics were granted at the University of North Carolina in 1950:

Name	Thesis	Minor
Raghu Raj Bahadur	On a Class of Decision Problems in the Theory of R Populations	Experimental Statistics and Mathematics
Kenneth A. Bush	Orthogonal Arrays	Mathematics and Economics
Max Halperin	Estimation in Truncated Sampling Processes	Experimental Statistics and Mathematics
Sharad-Chandra S. Shrikhande	Construction of Partially Balanced Designs and Related Problems	Experimental Statistics
Shanti A. Vora	Bounds on the Distribution of Chi-square	Experimental Statistics

New Members

The following persons have been elected to membership in the Institute.

(September 1, 1950-to November 30, 1950)

Berger, Richard, M.A. (Columbia Univ.), Statistician-Economist, General Aniline & Film Corporation, 230 Park Avenue, New York 17, New York.

Boll, C. H., B.S. (Stanford Univ.), Graduate Student in Statistics, Stanford University, *1247 Cowper, Palo Alto, California.*

Chacon, Enrique, S. J., Ph.D. (Univ. of Madrid), Professor of Statistics, University of Deusto, *Apartado 1, Bilboa, Spain.*

Curcio, F. L., M.S. .(Univ. of Pa.), Graduate Student, Department of Mathematical Statistics, Columbia University, *559 Broadlawn Terrace, Vineland, New Jersey.*

Derman, Cyrus, A.M. (Univ. of Pa.), Graduate Student, Department of Mathematical Statistics, Columbia University, *449 MacDade Boulevard, Collingdale, Pennsyvlania.*

de Finetti, Bruno, Ph.D. (Univ. of Milano), Professor, University of Trieste, *via Coroneo 43, Trieste, Italy.*

Geisser, Seymour. B.A. (City College of N. Y.), Graduate Student, University of North Carolina, *B-Dormitory, Room 312, Chapel Hill, North Carolina.*

Getchell, B. C., Ph.D. (Univ. of Mich.), Research Analyst, Department of Defense, *903 N. Wayne St., Apt. 305, Arlington, Virginia.*

Guerreiro, Amaro, B. Litt. (Oxford Univ.), Head of Research Division, Instituto Nacional de Estatistica, *48, Av. Marques de Tomar, Lisbon, Spain.*

Haddad, R. K., B.A. (N. Y. Univ.), Teaching Assistant in Psychology, Graduate School of Arts and Sciences, New York University, *43-02 63 Street, Woodside, New York.*

Hogg, R. V., Ph.D. (Univ. of Iowa), Assistant Professor, Department of Mathematics and Astronomy, State University of Iowa, Iowa City, Iowa.

Inselmann, E. H., A.B. (Temple Univ.), Graduate Student, Columbia University, *4253 N. 6th St., Philadelphia 40, Pennsylvania.*

Kitagawa, Tosio, Ph.D. (Tokyo Univ.), Professor of Mathematical Statistics, Kyushu University, and Chief, Committee of Research Association of Statistical Sciences, Faculty of Science, University of Kyushu, Fukuoka, Japan

Kurtz, T. E., A.B. (Knox College, Ill.), Research Assistant, Mathematics Department, Princeton University, Fine Hall, Box 708, Princeton, New Jersey.

Lanteli, Gunnar, Fil. Kand. (Lund), Actuary of Försäkringsaktiebolaget Hansa Stockholm 7, Sweden.

Leimbacher, W. R., Dipl. Math. (Switzerland), Teaching Assistant at Federal Institute of Technology, *64, Ringstresse, Zurich 57, Switzerland.*

McCall, C. H., Jr., A.B. (George Wash. Univ.), Assistant in Statistics and Graduate Student, George Washington University, *6701-44th Street, Chevy Chase 15, Maryland.*

Matérn, Bertil, Fil. Lic. (Stockholm Univ.), Assistant Professor, Swedish Forest Research Institute, *Lappkarrsvagen 47, Stockholm 50, Sweden.*

Matthias, R. H., A.B. (Amherst College), Graduate Student, Department of Mathematical Statistics, University of North Carolina, *Purefoy Road, Chapel Hill, North Carolina.*

Ortiz, C. L. B., Ingeniero Civil (Paris), Asesor Analista, Direccion Navional de Estadistica, Contraloria General de la Republica, Bogota, Colombia.

Poch, F. A., Licencia do en Ciencias (Univ. of Madrid), Official of Instituto Nacional de Estadistica; Specialist of Section of Methodology; Assistant Professor of Mathematical Statistics, University of Madris, *Federico Rubio, 106, Madrid, Spain.*

Sastry, N.S.R., Ph.D. (London School of Econ.), Officer and Director of Statistics, Department of Research and Statistics, Reserve Bank of India, Post Bag No. 1036, Bombay 1, India.

Skibinsky, Morris, B.S. (City College of N. Y.), Graduate Student, Department of Mathematical Statistics, University of North Carolina, *Room 323 B-Dormitory, Chapel Hill, North Carolina.*

Sullivan, J. R., M.A. (Georgetown Univ.), Instructor in Mathematics, Clemson College, South Carolina (on leave); and Graduate Student, University of North Carolina, *18-C, Lennox, Chapel Hill, North Carolina.*

Tornqvist, Leo, Ph.D. (Abo Akademi), Professor in Statistics, Institute of Statistics, University of Helsinki, Helsinki, Suomi (Finland).

von Guerard, Hermann W., Director, Statist. Amts., Lambertusstr. 1, Dusseldorf, Germany.

Wunsche, Gunther, Dipl. Math. (Tech. Univ. of Dresden), Chefmathematiker und Prokurist, Universitatsdozent, *Lenbachplatz 4, Munich 2, Germany.*

REPORT OF THE CHICAGO MEETING OF THE INSTITUTE

The thirteenth Annual Meeting and forty-fifth meeting of the Institute of Mathematical Statistics was held in Chicago, December 27–29, 1950. Headquarters were at the Congress Hotel. Sessions were held at the Congress Hotel, Roosevelt College and the Palmer House. One or more sessions were held in conjunction with one or more of the following organizations: the American Statistical Association, the Econometric Society, the American Association of University Teachers of Insurance, the American Economic Association, the American Farm Economic Association, the American Marketing Association, the American Psychological Association, the American Public Health Association, the American Society for Quality Control (Chicago Section), the Association for Computing Machinery, the Biometric Society (Eastern North American Region), the Population Association of America, and the Psychometric Society. The following 266 members of the Institute attended:

Helen Abbey, F. S. Acton, Beatrice Aitchison, A. A. Alchian, J. E. Alman, R. L. Anderson, T. W. Anderson, E. E. Ard, K. J. Arnold, K. J. Arrow, Max Astrachan, G. J. Auner, R. R. Bahadur, E. W. Bailey, J. C. Bain, T. A. Bancroft, E. W. Barankin, Walter Bartky, W. D. Baten, R. E. Bechhofer, B. M. Bennett, Richard Berger, Z. W. Birnbaum, C. I. Bliss, Isadore Blumen, C. R. Blyth, A. H. Bowker, R. A. Bradley, Dorothy S. Brady, A. E. Brandt, M. F. Bresnahan, C. A. Bridger, Jean Bronfenbrenner, I. D. J. Bross, R. W. Burgess, L. D. Calvin, J. M. Cameron, E. S. Cansado, A. G. Carlton, C. G. Carlyle, O. S. Carpenter, Maria Castellani, F. R. Cella, Herman Chernoff, Randolph Church, W. G. Cochran, C. H. Coombs, Jerome Cornfield, J. H. Cover, Gertrude M. Cox, C. C. Craig, E. L. Crow, S. L. Crump, E. E. Cureton, Cuthbert Daniel, D. A. Darling, Besse B. Day, F. R. Del Priore, D. B. DeLury, W. E. Deming, B. W. Dempsey, Lucile Derrick, J. L. Doob, H. F. Dorn, D. B. Duncan, C. W. Dunnett, David Durand, A. M. Dutton, P. S. Dwyer, Churchill Eisenhart, Lila Elveback, Benjamin Epstein, H. P. Evans, W. D. Evans, W. T. Federer, Robert Ferber, J. W. Fertig, Evelyn Fix, M. M. Flood, E. J. Frank, L. R. Frankel, D. A. S. Fraser, H. A. Freeman, H. C. Fryer, R. P. Gage, M. A. Girshick, Mary A. Goins, L. A. Goodman, Roe Goodman, B. G. Greenberg, S. W. Greenhouse, J. A. Greenwood, L. E. Grosh, F. A. Gross, F. E. Grubbs, Harold Gulliksen, L. S. Gunlogson, John Gurland, R. K. Haddad, R. J. Hader, K. W. Halbert, Max Halperin, F. J. Halton, M. H. Hansen, H. H. Harman, T. E. Harris, H. L. Harter, Mina Haskind, P. M. Hauser, W. C. Healy, Jr., F. M. Hemphill, J. L. Hodges, Jr., William Hodgkinson, Jr., R. G. Hoffmann,