HENRY LEWIS RIETZ—IN MEMORIAM

By A. R. Crathorne

University of Illinois

Forty odd years ago few if any American college catalogs mentioned the words "mathematical statistics." The word "actuary" often called for the use of a dictionary. Some courses in the theory of probability, theory of errors, or method of least squares touched on some phases of statistics but aside from this there was little interest in the subject. In England at this time Karl Pearson was well started in his work at University College but "Student" was an undergraduate student. In Germany, Lexis was finishing his somewhat unrecognized labors at Goettingen. In Denmark, Thiele, and in Norway, Charlier were lecturing and writing on statistics from their own individual viewpoints.

During the four decades which have passed, the interest in theoretical statistics in the United States has increased to the point where it has a well established journal of its own and few university mathematical departments fail to list statistical courses. In this growth no one has had more influence than the subject of this memoir. His published papers, his personality, his students and his well directed energy have all been more than helpful in putting mathematical statistics where it is today.

Henry Lewis Rietz, son of Jacob and Tabitha Jane Rietz, was born August 24, 1875 at Gilmore, Ohio. He attended the local schools and in 1895 entered Ohio State University receiving his B.S. degree in 1899. After graduation he went to Cornell University as scholar, then fellow and assistant in mathematics. During his stay at Cornell he was closely associated with two other mathematical students, J. W. Young and H. W. Kuhn, later heads of the departments of mathematics at Dartmouth and Ohio State University respectively. In his last year Rietz was particularly interested in group theory and worked for his doctorate with Professor G. A. Miller who was then a member of Cornell's faculty. His dissertation was "On primitive groups of odd orders," published later in the *American Journal of Mathematics* and referred to in the *Encyclopedie des Sciences Mathematiques*. After receiving the Ph.D. in 1902 he spent one year as professor of mathematics and astronomy at Butler College in Indianapolis.

In 1903, Rietz accepted an instructorship at the University of Illinois where he stayed until 1918 becoming full professor in the meantime. In 1918 he was called to the University of Iowa as head of the department of mathematics, a position he held until his retirement in 1942.

During his first year at Illinois his interests were mainly in pure mathematics. His advanced courses were "Theory of Invariants" during the first semester and "Higher Plane Curves" during the second. During the next year a demand arose for some course in statistics. None of the members of the mathematics department were particularly prepared to give such a course but Rietz was induced to try it. The result was that he offered a course "Averages and

Mathematics of Investment." This curious title was evidence of the fact that actuarial science had not reached the independent position that it has at the present time. In the following year he was appointed to the position of statistician of the College of Agriculture and from that time on during his stay at Illinois he divided his time equally between the department of mathematics and that college. His work as statistician was mainly supervision of the statistical work in the published bulletins. The first publication in the statistical field under his name was the 32-page appendix to Dean Davenport's treatise on breeding.

The first published statistical study was in 1908, a master's thesis for Miss Shade on "Correlation of efficiency in mathematics and in other subjects," printed as one of a series of University Studies. It is interesting to recall the attention which this paper received, especially from educational circles. It seemed to fix the method and form of calculation of correlation coefficients which occupied the time of many people during the following years. In these early years it was rather difficult to find a place of publication for a mathematical paper on statistics. Mathematical journals were somewhat reluctant in accepting articles. I remember one occasion when he jokingly complained of the correspondence necessary to explain to an editor the word "correlation" used in a paper.

From 1908 on, Rietz published a long list of papers on statistical topics, some purely theoretical, some expositional, some arising out of his connection with the college of Agriculture. Together with his later actuarial studies the list totals 150 titles, the more important of which are included in this article. His much quoted paper of 1920 on "Urn Schemata" pleased him more than any other paper. His little book *Mathematical Statistics*, one of the Carus mathematical monographs, written in 1926 was the basis for many university courses for years afterward.

In 1909 the American Institute of Actuaries was organized in Chicago, and Rietz was a charter member. He took particular delight in this organization and was rarely absent from the meetings. He was elected vice-president in 1919. He liked meeting practical actuaries and had a wide acquaintance among them. In 1916 he was appointed a member of the Illinois Pension Laws Commission and became its actuary. From that time on his interests were pretty evenly divided between mathematical statistics and actuarial problems connected with pensions. He was appointed actuary of the Chicago Pension Commission in 1926, was consulting actuary for the Presidents National Committee on Economic Security 1934, and was a member of the board of trustees of the Teacher's Insurance and Annuity Association 1934–38. His services as a consulting actuary were sought by a great many pension projects both in educational and in business circles. When he went to the University of Iowa in 1918, he accented actuarial theory in his teaching. Under his leadership the department became an outstanding school in this field. Many of his students hold prominent positions in the actuarial world.

In 1923, Rietz with eight others was appointed a member of the Committee on the Mathematical Analysis of Statistics of the division of Physical Sciences of the National Research Council. The work of this committee developed into the preparation of the "Handbook of Mathematical Statistics" with Rietz as Editor-in-Chief. This work had considerable use for a number of years after its publication and is an important part of the history of mathematical statistics in this country. A Russian edition of this book appeared in 1927 with a very long preface as a sort of apology for the translation. A few excerpts from this preface are—"Mathematical statistics is a purely technical weapon, politically unbiased, can serve with equal facility either to thwart or to expedite the movement for the emancipation of the proletariat depending in whose hands it happens to be;" "Mathematical statistics has nothing to do with philosophical enlightenment;" "Hence this book harbors no dangers for a soviet reader;" "The fact that the western authors work in a bourgeois society has no bearing on their methods."

The Institute of Mathematical Statistics was organized in 1935 with Rietz as the informal chairman of a steering committee during the months of discussion preceding the organization. He thus became the logical first president. He has taken a more than active interest in the Institute,—as a contributor to the *Annals*, as one of its editors, as general counselor, as a good friend. In appreciation of this and in recognition of his contributions to the initiation and development of mathematical statistics in America, the 1943 volume of the *Annals of Mathematical Statistics* was dedicated to him, on the occasion of his retirement after twenty five years of service as head of the department of mathematics at the University of Iowa.

Professor Rietz received many honors in other fields. He was President of the Mathematical Association of America in 1924, vice-president of the American Statistical Association in 1925, vice-president of the American Mathematical Society 1928–9, and a member of the editorial staffs of the Bulletin and the Transactions of that society for many years, president of the Iowa Academy of Science, 1931. He was starred in American Men of Science, a fellow of the Royal Statistical Society of London, and of the American Association for the Advancement of Science. He took great interest in local affairs and held many offices in church, social and business organizations in Iowa City. His mind was not altogether centered upon research and the development of mathematics and statistics. He took great pride in his teaching. He was the principal author of a number of college texts in mathematics that had wide use, and was on many committees concerned with the problem of teaching mathematics to undergraduates.

At the time of his retirement, Professor Rietz was in failing health and was practically an invalid until the time of his death at the University Hospital at Iowa City on December 7, 1943. He leaves a brother, Professor John Rietz, Morgantown, West Virginia, and a sister, Mrs. T. S. Taylor, Caldwell, New Jersey.

SELECTED TITLES OF PUBLICATIONS BY H. L. RIETZ

1. "On primitive groups of odd order," *Amer. Jour. of Math.*, Vol. 26 (1904), pp. 1–30.
2. "On groups in which certain commutative operations are conjugate," *Trans. Amer. Math. Soc.*, Vol. 5(1904), pp. 500–508.
3. "Simply transitive groups which are simple groups," *Bulletin Amer. Math. Soc.*, Vol. 11(1905), pp. 545–46.
4. "Statistical Methods. Appendix to Principles of Breeding." *A Treatise on Thremmatology* by E. Davenport, Ginn and Co., Boston, 1907, pp. 681–713.
5. "Correlation of efficiency in mathematics and efficiency in other subjects—A Statistical Study," Rietz and Shade, The University Studies, Urbana, Illinois, November 1908, 20 pp.
6. *Statistical Methods Applied to the Study of Type and Variability in Corn*, Eugene Davenport and Henry L. Rietz, Bulletin No. 119, Illinois Agricultural Experiment Station, 1907.
7. "On inheritance in the production of butter fat," *Biometrika*, London, Vol. 7(1909), pp. 106–126.
8. "On a mean difference problem that occurs in statistics," *Amer. Math. Month.*, Vol. 17(1910), pp. 235–40.
9. "On the metabolism experiment as a statistical problem," Rietz and Mitchell. *Jour. of Biol. Chem.*, 1910.
10. *On the Measurement of Correlation with Special Reference to Some Characters of Indian Corn*, Henry L. Rietz and Louis H. Smith, Bulletin No. 148, University of Illinois Agricultural Experiment Station, November 1910.
11. "On the construction and graduation of a rural life table," Rietz, H. L. and Forsyth, C. H., *Record Amer. Inst. of Actuar.*, Vol. 1(1911), pp. 9–19.
12. "On the theory of correlation with special reference to certain significant loci on the plane of distribution in the case of normal correlation," *Annals of Math.*, Vol. 13(1912), pp. 187–199.
13. "Note on the definition of an asymptote," *Amer. Math. Month.*, Vol. 19 (1912), pp. 89–90.
14. "The determination of the relative volumes of the components of rocks by mensuration methods," Lincoln and Rietz. *Economic Geology*, Vol. VIII, No. 2, March, 1913.
15. "On the mathematical theory of risk and Landre's theory of the maximum," *Record Amer. Inst. Actuar.*, Vol. 11(1913), pp. 1–14.
16. "On the status of certain current pension funds," *Record Amer. Inst. Actuar.*, Vol. 3(1914), pp. 33–53.
17. "Group Insurance," *Record Amer. Inst. Actuar.*, Vol. 3(1914), pp. 277–79.
18. "Degrees of resemblance of parents and offspring with respect to birth as twins for registered Shropshire sheep." (Rietz, H. L. and Roberts, Elmer.) *Jour. Agric. Res.*, Vol. 4, No. 6, pp. 479–510.
19. "Note on double interpolation by finite differences," *Record Amer. Inst. Actuar.*, Vol. 4(1915), pp. 15–22.
20. "On the correlation of marks in mathematics and law," *Jour. Educ. Psych.*, Vol. 7, No. 2, pp. 87–92.
21. "The operation of pension laws in foreign countries," Report of Illinois Pension Laws Commission, 1916, pp. 19–35.
22. "Actuarial Report on Pension Funds for Public Employees of Illinois," H. L. Rietz, and D. F. Campbell, Report of Illinois Pension Laws Commission, 1916, pp. 72–199.
23. "The underlying principles of a pension plan," H. L. Rietz, G. E. Hooker, and D. F. Campbell, Report of Illinois Pension Laws Commission, 1916, pp. 272–284.
24. "Report of Illinois Pension Laws Commission," Rietz and others, 1916, pp. 310.

25. "On the value of certain proposed refunds payable at the death of an annuitant under a pension system," *Record Amer. Inst. Actuar.*, Vol. 6(1917), pp. 62–75.

26. "A statistical study of some indirect effects of certain selections in the breeding of indian corn," Rietz, H. L. and Smith, L. H., *Jour. of Agric. Res.*, Vol. 11(1917), pp. 105–46.

27. "Methods of providing for expenses of new business by life insurance companies," *Amer. Econ. Rev.*, Vol. 7(1917), pp. 832–38.

28. "A Report to the Trustees of the Carnegie Foundation by the Commission Chosen to study and report upon the Proposed Plan of Insurance and Annuities," Rietz and others, 19 pp.

29, "Pensions for public employees," *Amer. Polit. Sci. Review*, Vol. 12(1918), pp. 265–68.

30. "Statistical methods for preparation for war department service," *Amer. Math. Month.*, Vol. 26(1919), pp. 99–100.

31. "Recent developments in pension plans for public employees," *Record Amer. Inst. Actuar.*, Vol. 8(1919), pp. 1–12.

32. "Scope and advantages of courses of instruction on life insurance in American colleges and universities," *Record Amer. Inst. Actuar.*, Vol. 8(1919), pp. 202–06.

33. "The effect of present inflated prices on the future interest rate," *Record Amer. Inst. Actuar.*, Vol. 8(1919), pp. 308–14.

34. "On functional relations for which the coefficient of correlation is zero," *Quart. Pub. Amer. Stat. Assn.* September 1919, pp. 472–76.

35. "Exposition of the main provisions of the standard plan for a combined comprehensive annuity and insurance system for public employees," Illinois Pension Laws Commission Report, 1919, pp. 25–48.

36. "Recent developments in pension legislation in other states of the United States," Illinois Pension Laws Commission Report, 1919, pp. 201–06.

37. "The world's experience in the operation of public service pension systems," Illinois Pension Commission Report, 1919, p. 207–14.

38. "Summary of the report of the Illinois Pension Laws Commission of 1916," Illinois Pension Commission Report, 1919, pp. 215–22.

39. "Effects of the pension legislation by the fiftieth general assembly of Illinois," Illinois Pension Commission Report, 1919, pp. 223–34.

40. "Illinois state teachers' pension and retirement system. Illinois Pension Commission Report," 1919, pp. 235–38.

41. "Industrial and institutional pension systems," Illinois Pension Commission Report, 1919, pp. 239–50.

42. "Urn schemata as a basis for the development of correlation theory," *Annals of Math.*, Vol. 21(1920), pp. 306–22.

43. "On certain properties of Makeham's laws of mortality," *Amer. Math. Month.*, Vol. 27(1921), pp. 152–65.

44. "Pension systems for insurance company employees," *Record Amer. Inst. Actuar.*, Vol. 10(1921), pp. 1–14.

45. "An elementary exposition of the theorem of Bernoulli with applications to statistics," *Math. Teacher*, Vol. 14(1921), pp. 427–34.

46. "Frequency distributions obtained by certain transformations of normally distributed variates," *Annals Math.*, Vol. 22(1922), pp. 292–300.

47. "'Statistics' in a Mathematical Encyclopedic Dictionary," *Amer. Math. Month.*, Vol. 29(1922), pp. 333–337.

48. "On the subject matter of a course in mathematical statistics," Presented before the Mathematical Association of America at the Symposium held in Cambridge, Dec. 29, 1922, *Amer. Math. Month.*, Vol. 30(1923), pp. 155–166.

49. "On certain topics in the mathematical theory of statistics," symposium Lectures before American Mathematical Society, *Bull. Amer. Math. Soc.*, Vol. 30(1924), pp. 417–453.

50. "On annuity rates," *Record Amer. Inst. Actuar.*, Vol. 13(1924), pp. 120–122.
51. "On certain applications of mathematical statistics to actuarial data," *Record Amer. Inst. Actuar.*, Vol. 13(1924), pp. 214–250.
52. "On a certain law of probability of Laplace," *Proc. Internat. Math. Cong.*, Toronto, Vol. 2(1924), pp. 795–799.
53. "Note on average numbers of brothers and of sisters of the boys in families of N children," *Science*, Vol. 60(1924), pp. 46–47.
54. "On the representation of a certain fundamental law of probability," *Trans. Amer. Math. Soc.*, Vol. 27(1925), pp. 197–212.
55. "On applications of statistical methods in actuarial science," *Record Amer. Inst. Actuar.*, Vol. 14(1925), pp. 102–04.
56. "Mathematical background for the study of statistics," H. L. Rietz and A. R. Crathorne, *Jour. Amer. Stat. Assn.*, Vol. 21(1926), pp. 435–440.
57. "On certain applications of the differential and integral calculus in actuarial science," *Amer. Math. Month.*, Vol. 33(1926), pp. 9–23.
58. "Note on the most probable number of deaths," *Record Amer. Inst. Actuar.*, Vol. 16(1927), pp. 25–29.
59. "On certain properties of frequency distributions of the powers and roots of the variates of a given distribution," *Proc. Nat. Acad. Sci.*, Vol. 13(1927), pp. 817–20.
60. Discussion of "Interpolation with modified coefficients," *Record Amer. Inst. Actuar.*, Vol. 16(1927), pp. 232–33.
61. "On the risk problem from a mathematical point of view," *Neuvienne Congres International D'Actuaires, Rapports, Tome II*, (1930), pp. 294–306.
62. "Pensions for superannuated employees," Retiring vice-presidential address before Section K. AAAS, *Sci. Month.*, March 1930, pp. 224–30.
63. "On certain properties of frequency distributions obtained by a linear fractional transformation of the variates of a given distribution," *Annals of Math. Stat.*, Vol. 2(1931), pp. 38–47.
64. "Note on the distribution of the standard deviation of sets of three variates drawn at random from a rectangular distribution," *Biometrika*, Vol. 23(1931), pp. 424–26.
65. "Some remarks on mathematical statistics," Retiring president's address before the Iowa Academy of Science, *Science*, Vol. 74(1931), pp. 1–4.
66. "Comments on applications of recently developed theory of small samples," *Jour. Amer. Stat. Assn.*, Vol. 26(1931), pp. 37–44.
67. "A simple non-normal correlation surface," *Biometrika*, Vol. 24(1932), pp. 288–90.
68. "On the Lexis theory and the analysis of variance," *Bull. Amer. Math. Soc.*, Vol. 27(1932), pp. 731–35.
69. "Unemployment and social insurance," *Record Amer. Inst. Actuar.*, Vol. 23(1934), pp. 147–52.
70. "On the frequency distribution of certain ratios," *Annals of Math. Stat.*, Vol. 7(1936), pp. 145–53.
71. "Some topics in sampling theory," *Bull. Amer. Math. Soc.*, Vol. 43(1937), pp. 209–30.
72. "Collective insurance," *Bull. Amer. Assn. Univ. Prof.*, Vol. 23(1937), pp. 278–81.
73. "On the distribution of the 'Student' ratio for small samples from certain non-normal distributions," *Annals Math. Stat.*, Vol. 10(1939), pp. 265–74.
74. "On a recent advance in statistical inference," *Amer. Math. Month.*, Vol. 45(1938), pp. 149–58.

DOCTORATE DISSERTATIONS WRITTEN UNDER THE SUPERVISION OF PROFESSOR RIETZ

Reilly, John Franklin, 1921. On certain generalizations of osculatory interpolation.

Weida, Frank M., 1923. The valuation of life annuities with refund of an arbitrarily assigned part of the purchase price.

Smith, Clarence De Witt, 1928. On generalized Tchebycheff inequalities in mathematical statistics.

Meyer, Herbert A., 1929. On certain inequalities with applications in actuarial science.

Craig, Allen Thornton, 1931. On the distribution of certain statistics derived from small random samples.

Wilks, Samuel Stanley, 1931. On the distribution of statistics in samples from a normal population of two variables with matched sampling of one variable.

Fischer, Carl H., 1932. On correlation surfaces of sums with a certain number of random elements in common.

Harper, Floyd S., 1935. An actuarial study of infant mortality.

Olliver, Arthur, 1935. On certain mathematical developments underlying an analysis of general death rates.

Knowler, Lloyd A., 1937. Actuarial aspects of recent old age security legislation.

Olshen, Abraham C., 1937. Transformations of the Pearson type III distribution.

Berg, William D., 1941. Theorems on certain type A difference equation graduations.

Satterthwaite, Franklin, 1941. Developments on the theory of Chi-square.

Garfin, Louis, 1942. A comparative study of the underlying principles of certain pension schemes for a staff of employees with special reference to teachers and public employees.

The last two dissertations were under the joint supervision of Professor Rietz and Professor A. T. Craig.

BOOKS

1. *College Algebra*, H. L. Rietz and A. R. Crathorne, First edition, 1909, Fourth edition, 1939. Henry Holt and Company, New York.

2. *School Algebra*, two volumes. H. L. Rietz, A. R. Crathorne, E. H. Taylor, 1915. Henry Holt and Company.

3. *Mathematics of Finance*, H. L. Rietz, A. R. Crathorne, J. C. Rietz. First edition 1921, second edition 1929. Henry Holt and Company.

4. *Introductory College Algebra*. H. L. Rietz and A. R. Crathorne. First edition 1923, second edition 1933. Henry Holt and Company.

5. *Handbook of Mathematical Statistics*, H. L. Rietz, Editor-in-chief, 1924, Houghton Mifflin Company.

6. *Mathematical Statistics*. Third Carus Mathematical Monograph, published for the Mathematical Association of America by the Open Court Publishing Co. 1927.

7. *Review of Pre-college Mathematics*, C. J. Lapp, F. B. Knight, H. L. Rietz, 1934. Scott, Foresman and Company.

8. *Plane Trigonometry*, H. L. Rietz, J. F. Reilly, Roscoe Woods, 1935. The Macmillan Company.

9. *Plane and Spherical Trigonometry*. H. L. Rietz, J. F. Reilly, Roscoe Woods, 1936. The Macmillan Company.

10. *Intermediate Algebra*, H. L. Rietz, A. R. Crathorne, L. J. Adams, 1942. Henry Holt and Company.

11. *Review of Mathematics for College Students*. C. J. Lapp, F. B. Knight, H. L. Rietz, 1942. Foresman and Company.