
References

1. I. Akyildiz. Mobility management in current and future communication networks. *IEEE Network Mag.* 12, 4 (1998) 39-49.
2. I. Akyildiz. Performance modeling of next generation wireless systems, Keynote Address, Conference on Simulation Methods and Applications, 1-3 November 1998, Orlando, Florida.
3. R.I. Al-Raoush and C. S. Willson. Extraction of physically realistic pore network properties from three-dimensional synchrotron X-ray microtomography images of unconsolidated porous media systems. Moving through scales of flow and transport in soil. *Journal of Hydrology*, 300, 1-4, (2005) 44-64.
4. P.L. Alger, Editor. **Life and times of Gabriel Kron**, Mohawk, New York, 1969. Cf. C.T.J Dodson, Diakoptics Past and Future, pp 288-9 *ibid*.
5. H. Alt, C. Dembrowski, H.D. Graf, R. Hofferbert, H. Rehfield, A. Richter and C. Schmit. Experimental versus numerical eigenvalues of a Bunimovich stadium billiard: A comparison. *Phys. Rev. E* 60, 3 (1999) 2851-2857.
6. S-I. Amari. **Diakoptics of Information Spaces** Doctoral Thesis, University of Tokyo, 1963.
7. S-I. Amari. Theory of Information Spaces—A Geometrical Foundation of the Analysis of Communication Systems. *Research Association of Applied Geometry Memoirs* 4 (1968) 171-216.
8. S-I. Amari. **Differential Geometrical Methods in Statistics** Springer Lecture Notes in Statistics 28, Springer-Verlag, Berlin 1985.
9. S-I. Amari, O.E. Barndorff-Nielsen, R.E. Kass, S.L. Lauritzen and C.R. Rao. **Differential Geometry in Statistical Inference**. Lecture Notes Monograph Series, Institute of Mathematical Statistics, Volume 10, Hayward California, 1987.
10. S-I. Amari. Dual Connections on the Hilbert Bundles of Statistical Models. In **Proc. Workshop on Geometrization of Statistical Theory** 28-31 October 1987. Ed. C.T.J. Dodson, ULDM Publications, University of Lancaster, 1987, pp 123-151.
11. S-I. Amari and H. Nagaoka. **Methods of Information Geometry**, American Mathematical Society, Oxford University Press, 2000.
12. Flavio S. Anselmetti, Stefan Luthi and Gregor P. Eberli. Quantitative Characterization of Carbonate Pore Systems by Digital Image Analysis. *AAPG Bulletin*, 82, 10, (1998) 1815-1836.

13. Khadiga Arwini. **Differential geometry in neighbourhoods of randomness and independence**. PhD thesis, Department of Mathematics, University of Manchester Institute of Science and Technology (2004).
14. Khadiga Arwini and C.T.J. Dodson. Information geometric neighbourhoods of randomness and geometry of the McKay bivariate gamma 3-manifold. *Sankhya: Indian Journal of Statistics* 66, 2 (2004) 211-231.
15. Khadiga Arwini and C.T.J. Dodson. Neighbourhoods of independence and associated geometry in manifolds of bivariate Gaussians and Freund distributions. *Central European J. Mathematics* 5, 1 (2007) 50-83.
16. Khadiga Arwini, L. Del Riego and C.T.J. Dodson. Universal connection and curvature for statistical manifold geometry. *Houston Journal of Mathematics* 33, 1 (2007) 145-161.
17. Khadiga Arwini and C.T.J. Dodson. Alpha-geometry of the Weibull manifold. Second Basic Science Conference, 4-8 November 2007, Al-Fatah University, Tripoli, Libya.
18. C. Baccigalupi, L. Amendola and F. Occhionero. Imprints of primordial voids on the cosmic microwave background *Mon. Not. R. Astr. Soc.* 288, 2 (1997) 387-96.
19. O.E. Barndorff-Nielsen, R.D. Gill and P.E. Jupp. On quantum statistical inference. *J. Roy. Statist. Soc. B* 65 (2003) 775-816.
20. O.E. Barndorff-Nielsen and D.R. Cox. **Inference and Asymptotics**. Monographs on Statistics and Applied Probability, 52. Chapman & Hall, London, 1994
21. A.H. Barnett. <http://math.dartmouth.edu/~ahb/pubs.html>
22. A.J. Benson, F. Hoyle, F. Torres and M.J. Vogeley. LGalaxy voids in cold dark matter universes. *Mon. Not. R. Astr. Soc.* 340 (2003) 160-174.
23. M.V. Berry. Private communication. 2008.
24. M.V. Berry. Quantum Chaology. *Proc. Roy. Soc. London A* 413, (1987) 183-198.
25. M.V. Berry and M. Tabor. Level clustering in the regular spectrum. *Proc. Roy. Soc. London A* 356, (1977) 373-394.
26. M.V. Berry and M. Robnik. Semiclassical level spacings when regular and chaotic orbits coexist. *J. Phys. A Math. General* 17, (1984) 2413-2421.
27. A. Bhattacharyya. On a measure of divergence between two statistical populations defined by their distributions. *Bull. Calcutta Math. Soc.* 35 (1943) 99-110.
28. Marcelo Biassusi. **Estudo da Deformao de um Vertissolo Atravs da Tomografia Computadorizada de Dupla Energia Simultnea**. *Phd Thesis*, UFRGS - Federal University of Rio Grande do Sul, Porto Alegre, Brazil. February 1996.
29. D. Bloomberg. Basic Definitions in Mathematical Morphology. www.leptonica.com/papers, April 2003.
30. O. Bohigas, M.J. Giannoni and C. Schmit. Characterization of Chaotic Quantum Spectra and Universality of Level Fluctuation Laws. *Phys. Rev. Lett.* 52, 1 (1984) 1-4.
31. K. Borovkov. **Elements of Stochastic Modelling**, World Scientific and Imperial College Press, Singapore and London, 2003.
32. U. Boudriot, R. Dersch, A. Greiner, and J.H. Wendorf. Electrospinning approaches toward scaffold engineering—A brief overview. *Artificial Organs* 10 (2006) 785-792.

33. G. Le Caër, C. Male and R. Delannay. Nearest-neighbour spacing distributions of the β -Hermite ensemble of random matrices. *Physica A* (2007) 190-208. Cf. also their Erratum: *Physica A* 387 (2008) 1713.
34. Y. Cai, C.T.J. Dodson, O. Wolkenhauer and A.J. Doig. Gamma Distribution Analysis of Protein Sequences shows that Amino Acids Self Cluster. *J. Theoretical Biology* 218, 4 (2002) 409-418.
35. M. Calvo and J.M. Oller. An explicit solution of information geodesic equations for the multivariate normal model. *Statistics & Decisions* 9, (1990) 119-138.
36. D. Canarutto and C.T.J. Dodson. On the bundle of principal connections and the stability of b-incompleteness of manifolds. *Math. Proc. Camb. Phil. Soc.* 98, (1985) 51-59.
37. B. Canvel. **Timing Tags for Exponentiations for RSA** MSc Thesis, Department of Mathematics, University of Manchester Institute of Science and Technology, 1999.
38. B. Canvel and C.T.J. Dodson. Public Key Cryptosystem Timing Analysis. *Rump Session, CRYPTO 2000*, Santa Barbara, 20-24 August 2000. <http://www.maths.manchester.ac.uk/~kd/PREPRINTS/rsatim.ps>
39. A. Cappi, S. Maurogordato and M. Lachiéze-Rey A scaling law in the distribution of galaxy clusters. *Astron. Astrophys.* 243, 1 (1991) 28-32.
40. J. Castro and M. Ostoj-Starzewski. Particle sieving in a random fiber network. *Appl. Math. Modelling* 24, 8-9, (2000) 523-534.
41. S. Chari, C.S. Jutla, J.R. Rao and P. Rohatgi. Towards sound approaches to counteract power-analysis attacks. In **Advances in Cryptology-CRYPTO '99**, Ed. M. Wiener, Lecture Notes in Computer Science 1666, Springer, Berlin 1999 pp 398-412.
42. P. Coles. Understanding recent observations of the large-scale structure of the universe. *Nature* 346 (1990) 446.
43. L.A. Cordero, C.T.J. Dodson and M. deLeon. **Differential Geometry of Frame Bundles**. Kluwer, Dordrecht, 1989.
44. L.A. Cordero, C.T.J. Dodson and P.E. Parker. Connections on principal S^1 -bundles over compacta. *Rev. Real Acad. Galega de Ciencias XIII* (1994) 141-149.
45. H. Corte. Statistical geometry of random fibre networks. In **Structure, Solid Mechanics and Engineering Design** (M. Te'eni, ed.), Proc. Southampton Civil Engineering Materials Conference, 1969. pp. 341-355. Wiley Interscience, London, 1971.
46. H. Corte. Statistical geometry of random fibre networks. In **Structure, Solid Mechanics and Engineering Design**, Proc. Southampton 1969 Civil Engineering Materials Conference, vol. 1, (ed. M. Te'eni) pp341-355. Wiley-Interscience, London, 1971.
47. H. Corte and C.T.J. Dodson. Über die Verteilung der Massendichte in Papier. Erster Teil: Theoretische Grundlagen **Das Papier**, 23, 7, (1969) 381-393.
48. H. Corte and E.H. Lloyd. Fluid flow through paper and sheet structure. In **Consolidation of the Paper Web** *Trans. III^d Fund. Res. Symp. 1965* (F. Bolam, ed.), pp 981-1009, BPBMA, London 1966.
49. D.J. Croton et al. (The 2dFGRS Team). The 2dF Galaxy Redshift Survey: Higher order galaxy correlation functions. Preprint, arXiv:astro-ph/0401434 v2 23 Aug 2004.

50. D.J. Croton et al. (The 2dFGRS Team). The 2dF Galaxy Redshift Survey: Voids and hierarchical scaling models. Preprint, arXiv:astro-ph/0401406 v2 23 Aug 2004.
51. R. Dawkins. **The Selfish Gene** Oxford University Press, Oxford 1976—cf. also the enlarged 1989 edition.
52. P. Deift. Some open problems in random matrix theory and the theory of integrable systems. Preprint, arXiv:arXiv:0712.0849v1 6 December 2007.
53. L. Del Riego and C.T.J. Dodson. Sprays, universality and stability. *Math. Proc. Camb. Phil. Soc.* 103(1988), 515-534.
54. J.F. Delrue, E. Perrier, Z.Y. Yu and B. Velde. New Algorithms in 3D Image Analysis and Their Application to the Measurement of a Spatialized Pore Size Distribution in Soils. *Phys. Chem. Earth*, 24, 7, (1999) 639-644.
55. M. Deng. **Differential Geometry in Statistical Inference** PhD thesis, Department of Statistics, Pennsylvania State University, 1990.
56. M. Deng and C.T.J. Dodson. **Paper: An Engineered Stochastic Structure**. Tappi Press, Atlanta (1994).
57. G. Di Crescenzo and R. Ostrovsky. On concurrent zero-knowledge with pre-processing. In **Advances in Cryptology-CRYPTO '99** Ed. M. Wiener, Lecture Notes in Computer Science 1666, Springer, Berlin 1999 pp 485-502.
58. C.T.J. Dodson. Spatial variability and the theory of sampling in random fibrous networks. *J. Royal Statist. Soc.* 33, 1, (1971) 88-94.
59. C.T.J. Dodson. Systems of connections for parametric models. In **Proc. Workshop on Geometrization of Statistical Theory** 28-31 October 1987. Ed. C.T.J. Dodson, ULDM Publications, University of Lancaster, 1987, pp 153-170.
60. C.T.J. Dodson. Gamma manifolds and stochastic geometry. In: **Proceedings of the Workshop on Recent Topics in Differential Geometry**, Santiago de Compostela 16-19 July 1997. *Public. Depto. Geometría y Topología* 89 (1998) 85-92.
61. C.T.J. Dodson. Information geodesics for communication clustering. *J. Statistical Computation and Simulation* 65, (2000) 133-146.
62. C.T.J. Dodson. Evolution of the void probability function. Presented at **Workshop on Statistics of Cosmological Data Sets**, 8-13 August 1999, Isaac Newton Institute, Cambridge.
<http://www.maths.manchester.ac.uk/kd/PREPRINTS/vpf.ps> . Cf. also [65].
63. C.T.J. Dodson. Spatial statistics and information geometry for parametric statistical models of galaxy clustering. *Int. J. Theor. Phys.*, 38, 10, (1999) 2585-2597.
64. C.T.J. Dodson. Geometry for stochastically inhomogeneous spacetimes. *Non-linear Analysis*, 47 (2001) 2951-2958.
65. C.T.J. Dodson. Quantifying galactic clustering and departures from randomness of the inter-galactic void probability function using information geometry. <http://arxiv.org/abs/astro-ph/0608511> (2006).
66. C.T.J. Dodson. A note on quantum chaology and gamma manifold approximations to eigenvalue spacings for infinite random matrices. Proceedings CHAOS 2008, Chania Crete 3-6 June 2008. <http://arxiv.org/abs/math-ph/0802.2251>
67. C.T.J. Dodson, A.G. Handley, Y. Oba and W.W. Sampson. The pore radius distribution in paper. Part I: The effect of formation and grammage. *Appita Journal* 56, 4 (2003) 275-280.

68. C.T.J. Dodson and Hiroshi Matsuzoe. An affine embedding of the gamma manifold. *InterStat*, January 2002, 2 (2002) 1-6.
69. C.T.J. Dodson and M. Modugno. Connections over connections and universal calculus. In Proc. **VI Convegno Nazionale di Relativita General a Fisic Della Gravitazione** Florence, 10-13 Octobar 1984, Eds. R. Fabbri and M. Modugno, pp. 89-97, Pitagora Editrice, Bologna, 1986.
70. C.T.J. Dodson and T. Poston. **Tensor Geometry** Graduate Texts in Mathematics 130, Second edition, Springer-Verlag, New York, 1991.
71. C.T.J. Dodson and W.W. Sampson. The effect of paper formation and grammage on its pore size distribution. *J. Pulp Pap. Sci.* 22(5) (1996) J165-J169.
72. C.T.J. Dodson and W.W. Sampson. Modeling a class of stochastic porous media. *App. Math. Lett.* 10, 2 (1997) 87-89.
73. C.T.J. Dodson and W.W. Sampson. Spatial statistics of stochastic fibre networks. *J. Statist. Phys.* 96, 1/2 (1999) 447-458.
74. C.T.J. Dodson and W.W. Sampson. Flow simulation in stochastic porous media. *Simulation*, 74:6, (2000) 351-358.
75. C.T.J. Dodson and W.W. Sampson. Planar line processes for void and density statistics in thin stochastic fibre networks. *J. Statist. Phys.* 129 (2007) 311-322.
76. C.T.J. Dodson and J. Scharcanski. Information Geometric Similarity Measurement for Near-Random Stochastic Processes. *IEEE Transactions on Systems, Man and Cybernetics - Part A*, 33, 4, (2003) 435-440.
77. C.T.J. Dodson and S.M. Thompson. A metric space of test distributions for DPA and SZK proofs. *Poster Session, Eurocrypt 2000*, Bruges, 14-19 May 2000. <http://www.maths.manchester.ac.uk/kd/PREPRINTS/mstd.pdf>.
78. C.T.J. Dodson and H. Wang. Iterative approximation of statistical distributions and relation to information geometry. *J. Statistical Inference for Stochastic Processes* 147, (2001) 307-318.
79. A.G. Doroshkevich, D.L. Tucker, A. Oemler, R.P. Kirshner, H. Lin, S.A. Shectman, S.D. Landy and R. Fong. Large- and Superlarge-scale Structure in the Las Campanas Redshift Survey. *Mon. Not. R. Astr. Soc.* 283 4 (1996) 1281-1310.
80. F. Downton. Bivariate exponential distributions in reliability theory. *J. Royal Statist. Soc. Series B* 32 (1970) 408-417.
81. G. Efstathiou. Counts-in-cells comparisons of redshift surveys. *Mon. Not. R. Astr. Soc.* 276, 4 (1995) 1425-1434.
82. A.P. Fairall. **Large-scale structure in the universe** Wiley-Praxis, Chichester 1998.
83. Fernandes, C.P., Magnani, F.S. 1996. Multiscale Geometrical Reconstruction of Porous Structures. *Physical Review E*, 54, 1734-1741.
84. W. Feller. **An Introduction to Probability Theory and its Applications**. Volume 1, John Wiley, Chichester 1968.
85. W. Feller. **An Introduction to Probability Theory and its Applications**. Volume 2, John Wiley, Chichester 1971.
86. R.A. Fisher. Theory of statistical estimation. *Proc. Camb. Phil. Soc.* 122 (1925) 700-725.
87. M. Fisz. **Probability Theory and Mathematical Statistics**. 3rd edition, John Wiley, Chichester 1963.
88. P. J. Forrester, Log-Gases and Random Matrices, Chapter 1 Gaussian matrix ensembles. Online book manuscript <http://www.ms.unimelb.edu.au/~matpjf/matpjf.html>, 2007.

89. R.J. Freund. A bivariate extension of the exponential distribution. *Journal of the American Statistical*, 56, (1961) 971-977.
90. K. Fukunga. *Introduction to Statistical Pattern Recognition*, 2nd Edition, Academic Press, Boston 1991.
91. B. Ghosh. Random distances within a rectangle and between two rectangles. *Calcutta Math. Soc.* 43, 1 (1951) 17-24.
92. S. Ghigna, S. Borgani, M. Tucci, S.A. Bonometto, A. Klypin and J.R. Primack. Statistical tests for CHDM and Lambda CDM cosmologies. *Astrophys. J.* 479, 2, 1 (1997) 580-91.
93. J. Gleick. **CHAOS: Making a New Science**. Heinemann, London 1988.
94. O. Goldreich, A. Sahai and S. Vadham. Can Statistical Zero-Knowledge be made non-interactive? Or, on the relationship of SZK and NISZK. In **Advances in Cryptology-CRYPTO '99**, Ed. M. Wiener, Lecture Notes in Computer Science 1666, Springer, Berlin 1999 pp 467-484.
95. A. Goffeau, B.G. Barrell, H. Bussey, R.W. Davis, B. Dujon, H. Feldmann, F. Galibert, J.D. Hoheisel, C. Jacq, M. Johnston, E.J. Louis, H.W. Mewes, Y. Murakami, P. Philippsen, H. Tettelin and S.G. Oliver. Life with 6000 genes. *Science* 274, 546, (1996) 563-567.
96. R. Gosine, X. Zhao and S. Davis. Automated Image Analysis for Applications in Reservoir Characterization. In **International Conference on Knowledge-Based Intelligent Engineering Systems and Allied Technologies**, September 2000, Brighton, UK.
97. F. Götze and H. Kösters. On the Second-Order Correlation Function of the Characteristic Polynomial of a Hermitian Wigner Matrix. <http://arxiv.org/abs/math-ph/0803.0926> (2008).
98. Rao S. Govindaraju and M. Levent Kavvas. Characterization of the rill geometry over straight hillslopes through spatial scales. *Journal of Hydrology*, 130, 1, (1992) 339-365.
99. A. Gray **Modern Differential Geometry of Curves and Surfaces** 2nd Edition, CRC Press, Boca Raton 1998.
100. R.C. Griffiths. The canonical correlation coefficients of bivariate gamma distributions. *Annals Math. Statist.* 40, 4 (1969) 1401-1408.
101. P. Grzegorzewski and R. Wieczorkowski. Entropy-based goodness-of-fit test for exponentiality. *Commun. Statist. Theory Meth.* 28, 5 (1999) 1183-1202.
102. F.A. Haight. **Handbook of the Poisson Distribution** J. Wiley, New York, 1967.
103. A.W.J. Heijs, J. Lange, J.F. Schoute and J. Bouma. Computed Tomography as a Tool for Non-destructive Analysis of Flow Patterns in Macroporous Clay Soils. *Geoderma*, 64, (1995) 183-196.
104. F. Hoyle and M.S. Vogeley. Voids in the 2dF Galaxy Redshift Survey. *Astrophys. J.* 607 (2004) 751-764.
105. T.P. Hutchinson and C.D. Lai. **Continuous Multivariate Distributions, Emphasising Applications**, Rumsby Scientific Publishing, Adelaide 1990.
106. T-Y. Hwang and C-Y. Hu. On a characterization of the gamma distribution: The independence of the sample mean and the sample coefficient of variation. *Annals Inst. Statist. Math.* 51, 4 (1999) 749-753.
107. E.T. Jaynes. Information theory and statistical inference. *The Physical Review* 106 (1957) 620-630 and 108 (1957) 171-190. Cf. also the collection E.T. Jaynes, **Papers on probability, statistics and statistical physics** Ed. R. D. Rosenkrantz, Synthese Library, 158. D. Reidel Publishing Co., Dordrecht, 1983.

108. P.R. Johnston. The most probable pore size distribution in fluid filter media. *J. Testing and Evaluation* 11, 2 (1983) 117-121.
109. P.R. Johnston. Revisiting the most probable pore size distribution in filter media. The gamma distribution. *Filtration and Separation*. 35, 3 (1998) 287-292.
110. A.M. Kagan, Y.V. Linnik and C.R. Rao. **Characterization Problems in Mathematical Statistics** John Wiley, New York, 1973.
111. O. Kallmes and H. Corte. The structure of paper, I. The statistical geometry of an ideal two dimensional fiber network. *Tappi J.* 43, 9 (1960) 737-752. Cf. also: Errata 44, 6 (1961) 448.
112. O. Kallmes, H. Corte and G. Bernier. The structure of paper, V. The bonding states of fibres in randomly formed papers. *Tappi Journal* 46, 8, (1963) 493-502.
113. R.E. Kass and P.W. Vos. **Geometrical Foundations of Asymptotic Inference**. Wiley Series in Probability and Statistics: Probability and Statistics. A Wiley-Interscience Publication. John Wiley & Sons, Inc., New York, 1997.
114. G. Kauffmann and A.P. Fairall. Voids in the distribution of galaxies: an assessment of their significance and derivation of a void spectrum. *Mon. Not. R. Astr. Soc.* 248 (1990) 313-324.
115. M.D. Kaytor and S.T. Warren. Aberrant protein deposition and neurological disease. *J. Biological Chemistry* 53, (1999) 37507-37510.
116. R.A. Ketcham and Gerardo J. Iturrino. Nondestructive high-resolution visualization and measurement of anisotropic effective porosity in complex lithologies using high-resolution X-ray computed tomography. *Journal of Hydrology*, 302, 1-4, (2005) 92-106.
117. M. Kendall and A. Stuart. **The Advanced Theory of Statistics, Volume 2 Inference and Relationship** 4th Edition. Charles Griffin, London, 1979.
118. W.F. Kibble. A two variate gamma-type distribution. *Sankhyā* 5 (1941) 137-150.
119. P. Kocher, J. Jaffe and B. Jun. Differential Power Analysis. In **Advances in Cryptology-CRYPTO '99**, Ed. M. Wiener, Lecture Notes in Computer Science 1666, Springer, Berlin 1999 pp 388-397.
120. S. Kokoska and C. Nevison. **Statistical Tables and Formulae** Springer Texts in Statistics, Springer-Verlag, New York 1989.
121. K. Kondo, Editor. **Research Association of Applied Geometry Memoirs** Volume IV, Tokyo 1968.
122. S. Kotz, N. Balakrishnan and N. Johnson. **Continuous Multivariate Distributions** 2nd Edition, Volume 1 (2000).
123. I. Kovalenko. A simplified proof of a conjecture of D.G. Kendall concerning shapes of random polygons. *J. Appl. Math. Stochastic Anal.* 12, 4 (1999) 301-310.
124. G. Kron. Diakoptics—The Science of Tearing, Tensors and Topological Models. *RAAG Memoirs* Volume II, (1958) 343-368.
125. G. Kron. **Diakoptics—The Piecewise Solution of Large-Scale Systems**. MacDonald, London 1963.
126. S. Kullback. **Information and Statistics**, J. Wiley, New York, 1959.
127. T. Kurose. On the divergences of 1-conformally flat statistical manifolds. *Tôhoku Math. J.*, 46 (1994) 427-433.
128. F. Sylos Labini, A. Gabrielli, M. Montuori and L. Pietronero. Finite size effects on the galaxy number counts: Evidence for fractal behavior up to the deepest scale. *Physica A.* 226, 3-411 (1996) 195-242.

129. F. Sylos Labini, M. Montuori and L. Pietronero. Scale Invariance of galaxy clustering. *Physics Reports* 293 (1998) 61-226.
130. M. Lachi  ze-Rey, L.N. Da-Costa and S. Maurogordato. Void probability function in the Southern Sky Redshift Survey. *Astrophys. J.* 399 (1992) 10-15.
131. C.D. Lai. Constructions of bivariate distributions by a generalized trivariate reduction technique. *Statistics and Probability Letters* 25, 3 (1995) 265-270.
132. W.H. Landschulz, P.F. Johnson and S.L. McKnight. The Leucine Zipper - A hypothetical structure common to a new class of DNA-binding proteins. *Science* 240, (1988) 1759-1764.
133. S.D. Landy, S.A. Sackett, H. Lin, R.P. Kirshner, A.A. Oemler and D. Tucker. Two-dimensional power spectrum of the Las Campanas redshift survey: Detection of excess power on $100 h^{-1} Mpc$ scales. *Astroph. J.* 456, 1, 2 (1996) L1-7.
134. S.L. Lauritzen. Statistical Manifolds. In **Differential Geometry in Statistical Inference**, Institute of Mathematical Statistics Lecture Notes, Volume 10, Berkeley 1987, pp 163-218.
135. S. Leurgans, T.W-Y. Tsai and J. Crowley. Freund's bivariate exponential distribution and censoring, in **Survival Analysis** (R. A. Johnson, eds.), IMS Lecture Notes, Hayward, California: Institute of Mathematical Statistics, 1982.
136. H. Lin, R.P. Kirshner, S.A. Sackett, S.D. Landy, A. Oemler, D.L. Tucker and P.L. Schechter. The power spectrum of galaxy clustering in the Las Campanas Redshift Survey. *Astroph. J.* 471, 2, 1 (1996) 617-635.
137. A. Lupas. Coiled coils: New structures and new functions. *Trends Biochem. Sci.* 21, 10 (1996) 375-382.
138. S. Mallat. **A Wavelet Tour of Signal Processing**. Academic Press, San Diego, 1998.
139. R.E. Mark. Structure and structural anisotropy. Ch. 24 in **Handbook of Physical and Mechanical Testing of Paper and Paperboard**. (R.E. Mark, ed.). Marcel Dekker, New York, 1984.
140. L. Mangiarotti and M. Modugno. Fibred spaces, jet spaces and connections for field theories. In Proc. International Meeting on **Geometry and Physics**, Florence, 12-15 October 1982, ed. M. Modugno, Pitagora Editrice, Bologna, 1983 pp 135-165.
141. K.V. Mardia. **Families of Bivariate Distributions**. Griffin, London 1970.
142. A.W. Marshall and I. Olkin. A generalized bivariate exponential distribution. *J. Appl. Prob.* 4 (1967) 291-302.
143. H. Matsuzoe. On realization of conformally-projectively flat statistical manifolds and the divergences. *Hokkaido Math. J.*, 27 (1998) 409-421.
144. H. Matsuzoe. Geometry of contrast functions and conformal geometry. *Hiroshima Math. J.*, 29 (1999) 175-191.
145. Madan Lal Mehta. **Random Matrices** 3rd Edition, Academic Press, London 2004.
146. A.T. McKay. Sampling from batches. *J. Royal Statist. Soc.* 2 (1934) 207-216.
147. R.E. Miles. Random polygons determined by random lines in a plane. *Proc. Nat. Acad. Sci. USA* 52, (1964) 901-907, 1157-1160.
148. R.E. Miles. The various aggregates of random polygons determined by random lines in a plane. *Advances in Math.* 10, (1973) 256-290.
149. R.E. Miles. A heuristic proof of a long-standing conjecture of D.G. Kendall concerning the shapes of certain large random polygons. *Adv. in Appl. Probab.* 27, 2 (1995) 397-417.

150. G.K. Miller and U.N. Bhat. Estimation for renewal processes with unobservable gamma or Erlang interarrival times. *J. Statistical Planning and Inference* 61, 2 (1997) 355-372.
151. Steven J. Miller and Ramin Takloo-Bighash. **An Invitation to Modern Number Theory** Princeton University Press, Princeton 2006. Cf. also the seminar notes:
 - Steven J. Miller: Random Matrix Theory, Random Graphs, and L-Functions: How the Manhattan Project helped us understand primes. Ohio State University Colloquium 2003.
<http://www.math.brown.edu/~sjmiller/math/talks/colloquium7.pdf> .
 - Steven J. Miller. Random Matrix Theory Models for zeros of L-functions near the central point (and applications to elliptic curves). Brown University Algebra Seminar 2004.
<http://www.math.brown.edu/~sjmiller/math/talks/RMTandNTportrait.pdf>
152. M. Modugno. Systems of vector valued forms on a fibred manifold and applications to gauge theories. In Proc. Conference **Differential Geometric Methods in Mathematical Physics**, Salamanca 1985, Lecture Notes in Mathematics 1251, Springer-Verlag, Berlin 1987, pp. 238-264.
153. M.K. Murray and J.W. Rice. **Differential Geometry and Statistics**. Monographs on Statistics and Applied Probability, 48. Chapman & Hall, London, 1993.
154. K. Nomizu and T. Sasaki. **Affine differential geometry: Geometry of Affine Immersions**. Cambridge University Press, Cambridge, 1994.
155. B. Norman. Overview of the physics of forming. In **Fundamentals of Paper-making**, *Trans. IXth Fund. Res. Symp.*, (C.F. Baker, ed.), Vol III, pp. 73149, Mechanical Engineering Publications, London, 1989.
156. Y. Oba. **Z-directional structural development and density variation in paper**. Ph.D. Thesis, Department of Paper Science, University of Manchester Institute of Science and Technology, 1999.
157. A. Odlyzko. Tables of zeros of the Riemann zeta function.
http://www.dtc.umn.edu:80/~odlyzko/zeta_tables/index.html.
158. S.H. Ong. Computation of bivariate-gamma and inverted-beta distribution functions. *J. Statistal Computation and Simulation* 51, 2-4 (1995) 153-163.
159. R.N. Onody, A.N.D. Posadas and S. Crestana. Experimental Studies of the Fingering Phenomena in Two Dimensions and Simulation Using a Modified Invasion Percolation Model. *Journal of Applied Physics*, 78, 5, (1995) 2970-2976.
160. E.K. O'Shea, R. Rutkowski and P.S. Kim. Evidence that the leucine zipper is a coiled coil. *Science* 243, (1989) 538-542.
161. A. Papoulis. **Probability, Random Variables and Stochastic Processes** 3rd edition, McGraw-Hill, New York 1991.
162. P.J.E. Peebles. **Large Scale Structure of the Universe** Princeton University Press, Princeton 1980.
163. S. Penel, R.G. Morrison, R.J. Mortishire-Smith and A.J. Doig. Periodicity in α -helix lengths and C-capping preferences. *J. Mol. Biol.* 293, (1999) 1211-1219.
164. R. Penrose. **The Emperor's New Mind** Oxford University Press, Oxford 1989.
165. Q.P. Pham, U. Sharma and A.G. Mikos. Characterization of scaffolds and measurement of cellular infiltration. *Biomacromolecules* 7, 10 (2006) 2796-2805.
166. Huynh Ngoc Phien. Reservoir storage capacity with gamma inflows. *Journal of Hydrology*, 146, 1, (1993) 383-389.

167. T. Piran, M.Lecar, D.S. Goldwirth, L. Nicolaci da Costa and G.R. Blumenthal. Limits on the primordial fluctuation spectrum: void sizes and anisotropy of the cosmic microwave background radiation. *Mon. Not. R. Astr. Soc.* 265, 3 (1993) 681-8.
168. C.F. Porter. **Statistical Theory of Spectra: Fluctuations** Edition, Academic Press, London 1965.
169. S.O. Prasher, J. Perret, A. Kantzas and C. Langford. Three-Dimensional Quantification of Macropore Networks in Undisturbed Soil Cores. *Soil Sci. Soc. Am. Journal*, 63 (1999) 1530-1543.
170. B. Radvan, C.T.J. Dodson and C.G. Skold. Detection and cause of the layered structure of paper. In **Consolidation of the Paper Web** *Trans. IIT^d Fund. Res. Symp. 1965* (F. Bolam, ed.), pp 189-214, BPBMA, London 1966.
171. C.R. Rao. Information and accuracy attainable in the estimation of statistical parameters. *Bull. Calcutta Math. Soc.* 37, (1945) 81-91.
172. S.A. Riboldi, M. Sampaolesi, P. Neuenschwander, G. Cossub and S. Mantero. Electrospun degradable polyesterurethane membranes: potential scaffolds for skeletal muscle tissue engineering. *Biomaterials* 26, 22 (2005) 4606-4615.
173. B.D. Ripley. **Statistical Inference for Spatial Processes**. Cambridge University Press, Cambridge 1988.
174. R.L. Rivest, A. Shamir and L.M. Adleman. A method for obtaining digital key signatures and public-key cryptosystems. *Communications of the ACM* 21 (1978) 120-126.
175. S. Roman. **Coding and Information Theory**. Graduate Texts in Mathematics, 134 Springer-Verlag, New York, 1992.
176. S. Roman. **Introduction to Coding and Information Theory**. Undergraduate Texts in Mathematics. Springer-Verlag, New York, 1997.
177. Colin Rose and Murray D. Smith. **Mathematical Statistics with Mathematica** Springer texts in statistics, Springer-Verlag, Berlin 2002.
178. Z. Rudnick. Private communication. 2008. Cf. also Z. Rudnick. What is Quantum Chaos? *Notices A.M.S.* 55, 1 (2008) 33-35.
179. A. Rushkin, J. Soto et al. **A Statistical Test Suite for Random and Pseudorandom Number Generators for Cryptographic Applications**. *National Institute of Standards & Technology*, Gaithersburg, MD USA, 2001.
180. B.Ya. Ryabko and V.A. Monarev. Using information theory approach to randomness testing. Preprint: *arXiv:CS.IT/0504006 v1*, 3 April 2005.
181. W.W. Sampson. Comments on the pore radius distribution in near-planar stochastic fibre networks. *J. Mater. Sci.* 36, 21 (2001) 5131-5135.
182. W.W. Sampson. The structure and structural characterisation of fibre networks in papermaking processes.
183. Y. Sato, K. Sugawa and M. Kawaguchi. The geometrical structure of the parameter space of the two-dimensional normal distribution. Division of information engineering, Hokkaido University, Sapporo, Japan (1977).
184. M.R. Schroeder. **Number Theory in Science and Communication. With Applications in Cryptography, Physics, Digital Information, Computing, and Self-Similarity**. Springer Series in Information Science, 3rd edition, Springer, Berlin 1999.
185. K. Schulgasser. Fiber orientation in machine made paper. *J. Mater. Sci.* 20, 3 (1985) 859-866.
186. C.E. Shannon. A mathematical theory of communication. *Bell Syst. Tech. J.* 27, (1948) 379-423 and 623-656.

187. D. Shi and C.D. Lai. Fisher information for Downton's bivariate exponential distribution. *J. Statistical Computation and Simulation* 60, 2 (1998) 123-127.
188. S.D. Silvey. **Statistical Inference** Chapman and Hall, Cambridge 1975.
189. L.T. Skovgaard. A Riemannian geometry of the multivariate normal model. *Scand. J. Statist.* 11 (1984) 211-223.
190. D. Slepian, ed. **Key papers in the development of information theory**, IEEE Press, New York, 1974.
191. P. Soille. **Morphological Image Analysis: Principles and Applications**. Springer-Verlag, Heidelberg 1999.
192. M. Sonka and H. Hlavac. **Image Processing, Analysis, and Machine Vision**, 2nd. Ed. *PWS Publishing Co.*, 1999.
193. A. Soshnikov. Universality at the edge of the spectrum in Wigner random matrices. *Commun. Math. Phys.* 207 (1999) 697-733.
194. M. Spivak. **Calculus on Manifolds**. W.A. Benjamin, New York 1965.
195. M. Spivak. **A Comprehensive Introduction to Differential Geometry, Vols. 1-5**, 2nd edn. Publish or Perish, Wilmington 1979.
196. D. Stoyan, W.S. Kendall and J. Mecke. **Stochastic Geometry and its Applications** 2nd Edition, John Wiley, Chichester, 1995.
197. I. Szapudi, A. Meiksin and R.C. Nichol. Higher order statistics from the Edinburgh Durham Southern Galaxy Catalogue Survey. 1. Counts in cells. *Astroph. J.* 473, 1, 1 (1996) 15-21.
198. J.C. Tanner. The proportion of quadrilaterals formed by random lines in a plane. *J. Appl. Probab.* 20, 2 (1983) 400-404.
199. Taud H., Martinez-Angeles T. et al. 2005. Porosity Estimation Method by X-ray Computed Tomography. *Journal of Petroleum Science and Engineering*, 47, 209-217.
200. M. Tribus. **Thermostatistics and Thermodynamics** D. Van Nostrand and Co., Princeton N.J., 1961.
201. M. Tribus, R. Evans and G. Crellin. The use of entropy in hypothesis testing. In Proc. **Tenth National Symposium on Reliability and Quality Control** 7-9 January 1964.
202. R. van der Weygaert. Quasi-periodicity in deep redshift surveys. *Mon. Not. R. Astr. Soc.* 249 (1991) 159.
203. R. van der Weygaert and V. Icke. Fragmenting the universe II. Voronoi vertices as Abell clusters. *Astron. Astrophys.* 213 (1989) 1-9.
204. B. Velde, E. Moreau and F. Terribile. Pore Networks in an Italian Vertisol: Quantitative Characterization by Two Dimensional Image Analysis. *Geoderma*, 72, (1996) 271-285.
205. L. Vincent. Morphological Grayscale Reconstruction in Image Analysis: Applications and Efficient Algorithms. *IEEE Transactions of Image Processing*, 2 (1993) 176-201.
206. H.J. Vogel and A. Kretzchmar. *Topological Characterization of Pore Space in Soil-Sample Preparation and Digital Image-Processing*. *Geoderma*, 73, (1996) 23-18.
207. H.J. Vogel and K. Roth. Moving through scales of flow and transport in soil. *Journal of Hydrology*, 272, 1-4, (2003) 95-106.
208. M.S. Vogeley, M.J. Geller, C. Park and J.P. Huchra. Voids and constraints on nonlinear clustering of galaxies. *Astron. J.* 108, 3 (1994) 745-58.
209. H. Weyl. **Space Time Matter** Dover, New York 1950.

- 210. S.D.M. White. The hierarchy of correlation functions and its relation to other measures of galaxy clustering. *Mon. Not. R. Astr. Soc.* 186, (1979) 145-154.
- 211. H. Whitney. Differentiable manifolds, *Annals of Math.* 41 (1940) 645-680.
- 212. E.P. Wigner. Characteristic vectors of bordered matrices with infinite dimensions. *Annals of Mathematics* 62, 3 (1955) 548-564.
- 213. E.P. Wigner. On the distribution of the roots of certain symmetric matrices. *Annals of Mathematics* 67, 2 (1958) 325-327.
- 214. E.P. Wigner. Random matrices in physics. *SIAM Review* 9, 1 (1967) 1-23.
- 215. S. Wolfram. **The Mathematica Book** 3rd edition, Cambridge University Press, Cambridge, 1996.
- 216. S. Yue, T.B.M.J. Ouarda and B. Bobée. A review of bivariate gamma distributions for hydrological application. *Journal of Hydrology*, 246, 1-4, (2001) 1-18.

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