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Peter Guttorp · David Brillinger  
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# Selected Works of David Brillinger

 Springer

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## Preface to the Series

Springer's Selected Works in Probability and Statistics series offers scientists and scholars the opportunity of assembling and commenting upon major classical works in statistics, and honors the work of distinguished scholars in probability and statistics. Each volume contains the original papers, original commentary by experts on the subject's papers, and relevant biographies and bibliographies.

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The subjects of the volumes have been selected by an editorial board consisting of Anirban DasGupta, Peter Hall, Jim Pitman, Michael Sørensen, and Jon Wellner.





Lorie and David at the ISI meeting in Vienna 1973 (where he delivered the paper [32] in section 27).





## Preface

When I was asked to put together a Selected Works volume for David Brillinger, I never even considered saying no. But I realized that the hardest part of the job would be to convince David to let me do it. “The question that I keep asking myself is ‘Is that really me?’” he wrote to me. But eventually he relented, when I argued that this would make some of his interesting papers, that are now hard to find, available to everyone. He started sending me thick envelopes full of papers. Going through all of them was pure joy. The breadth of David’s contributions is incredible. Selecting which 600 pages out of the 224 entries in his bibliography (when I write this—when you read it there are undoubtedly more) to include was not so much joy. Some of his richest papers are just too long ([104] with Tukey, *Spectrum analysis in the presence of noise: some issues and examples*, is 141 pages, but can be found in Tukey’s Collected Works that David edited; [53] *Comparative aspects of the study of ordinary time series and of point processes* is 101. Both these papers are full of new ideas, many of which have not yet been fully developed). However, after a sequence of emails and a long session at a Berkeley coffee shop, we agreed on the current selection. It was fortunate that Victor Panaretos’ interview with David for *Statistical Science* was finished during this process, and could be included in this volume.

The selection contains all of David’s named lectures (Wald, Fisher, Herzberg, Hunter and Neyman), in which he carefully presents material from his research, always containing important answers to scientific questions and illustrated with LOTS of pictures. In addition, there are papers from his main methodological areas: time series and point processes; and from his three main scientific interests: neurophysiology, seismology and population biology. We tried to make sure that there were papers with the main people he has worked with: Bruce Bolt, Jose Segundo, Alan Ager, Brett Stewart and Haiganoush Preisler. Some important work, for example his papers in demography, or on using wavelets, there simply was not room for. As I said, his scientific work is very broad.

I was fortunate to have both Jerzy Neyman and David Brillinger as teachers and advisers. The principal lesson I learned from both of them is the importance of working hard at understanding the science behind the questions you are trying to address. Collaboration is key to modern statistical science.

In finding appropriate researchers to comment on David's papers I needed not go beyond his list of former PhD students (39 at last count). David's more theoretical work is discussed by Victor Panaretos (PhD 2007), a Greek working in Switzerland. Time series papers are discussed by Pedro Morettin (PhD 1973) from Brazil, a country David loves and visits as often as he can. Some biological papers are addressed by Tore Schweder (PhD 1975) from Norway, another country that David frequently visits, assisted by Haiganoush Preisler (PhD 1977), a Palestinian working in the US, while I (PhD 1980), a Swede working in the US, deal with point processes, neurophysiology and earth sciences.

David is a very close friend of mine. Apart from statistics, we share interests in politics, hockey, and soccer, which we discuss at great length in person or briefly in emails. When he recently was selected as honorary member of the Canadian Statistical Society, he remarked to me "Somehow that's all about another person. I am just me, a kid from Toronto who a lot of people have helped." Well, the kid from Toronto is a member of the Canadian, Brazilian and Norwegian Academies, has three honorary doctorates, and a share of the Nobel Peace Prize for work done for the IPCC [112]. Not only is he a most accomplished scientist, but he is the epitome of the modern statistical scientist.

So David, this is for you. We all hope you will enjoy it. Thanks for teaching us what a statistician can and should be, being there for us to talk about science, soccer, and survival, writing poetry in a dissertation or signing in Hollerith. We owe you so much.

Peter Guttorp

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20. Learning a potential function from a trajectory. *Signal Processing Letters*, Vol 14, 867–870 (2007). Reprinted with permission of the Institute of Electrical and Electronics Engineers. 361
21. A potential function approach to the flow of play in soccer. *J. Quantitative Analysis in Sports*, Issue 1 article 3, 20 pp. (2007). Reprinted with permission of the Berkeley Electronic Press. 365
22. The use of potential functions in modelling animal movement. *Data Analysis from Statistical Foundations: A Festschrift in Honour of the 75th Birthday of D.A.S. Fraser*, Saleh, A.K.M.E. editor, 369–386, Nova Science Publishers, Huntington, NY (2001). Reprinted with permission of Nova Science. 385
23. Elephant seal movements: modelling migration. *Can. J. Stat.* Vol. 26 No. 3, 431–443 (1998). Reprinted with permission of the Canadian Statistical Society. 411
24. Random process methods and environmental data: the 1996 Hunter Lecture. *Environmetrics* Vol. 8 No. 4, 269281 (1997). Reprinted with permission of Wiley-Blackwell. 425
25. The 2005 Neyman lecture: dynamic indeterminism in science. *Statistical Science* Vol. 23, 48–64 (2008). Reprinted with permission of the Institute of Mathematical Statistics. 439

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28. Estimation of uncertainties in eigenspectral estimates from decaying geophysical time series. *Geophys. J. Roy. Astron. Soc.* Vol. 59, 593–603 (1979). Reprinted with permission of the Royal Astronomical Society. 487
29. Statistical inference for stationary point processes. *Stochastic Processes and Related Topics* (Bloomington, IN, 1974), Puri, M.L. editor Vol. 1, 55–99, Academic Press, New York, NY (1975). Reprinted with permission of Elsevier. 499
30. The identification of point process systems. *Ann. Probability* Vol. 3 No. 6, 909–929 (1975). Reprinted with permission of the Institute of Mathematical Statistics. 545

31. Measuring the association of point processes: a case history.  
*Amer. Math. Monthly* Vol. 83, 16–22 (1976). Reprinted  
with permission of the Mathematical Association of America. 561
32. Empirical examination of the threshold model of neuron firing.  
*Biological Cybernetics* Vol. 35, 213–220 (1979). Reprinted  
with permission of Springer Science+Business Media. 569
33. Nerve cell spike train data analysis: a progression of technique.  
*J. Amer. Statist. Assoc.* Vol. 87, 260–271 (1992). 1991 R.A.  
Fisher Memorial Lecture. Reprinted with permission of the  
American Statistical Association. 577
34. A generalized linear model with “gaussian” regressor variables.  
*A Festschrift for Erich L. Lehmann*, Bickel, Peter J. and Doksum,  
Kjell and Hodges, Jr., J.L. editors, Wadsworth  
Statistics/Probability Series, 97–114, Chapman & Hall/CRC (1982).  
Reprinted with permission of Taylor and Francis. 589
35. The identification of a particular nonlinear time series system.  
*Biometrika* Vol. 64, 509–515 (1977). Reprinted with permission  
of the Oxford University Press. 609



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## Bibliography

- [1] Brillinger, D., 1961. *Asymptotic means and variances in the  $k$ -dimensional case*. Ph.D. thesis, Princeton University. 70 pp
- [2] Brillinger, D., 1961. A note on the definition of asymptotic normality for multi-dimensional random variables. *Estadística* **20** 371
- [3] Brillinger, D. R., 1961. A justification of some common laws of mortality. *Soc. Actuar. Trans.* **13** 116–126
- [4] Brillinger, D. R., 1962. Examples bearing on the definition of fiducial probability with a bibliography. *Annals of Mathematical Statistics* **33** 1349–1355
- [5] Brillinger, D. R., 1962. A note on the rate of convergence of a mean. *Biometrika* **49** 574–576
- [6] Brillinger, D. R., 1963. Necessary and sufficient conditions for a statistical problem to be invariant under a Lie group. *Ann. Math. Statist.* **34** 492–500
- [7] Brillinger, D. R., 1963. A note on the re-use of samples. *Ann. Math. Statist.* **34** 341–343
- [8] Brillinger, D., 1964. A technique for measuring the spectral density matrix of two signals. *Proc. IEEE* **52** 103–104
- [9] Brillinger, D. R., 1964. The asymptotic behaviour to Tukey’s general method of setting approximate confidence limits (the jackknife) when applied to maximum likelihood estimates. *Rev. Internat. Statist. Inst., Int. Stat. Rev.* **32** 202–206
- [10] Brillinger, D., 1965. A property of low-pass filters. *SIAM Review* **7** 65–67
- [11] Brillinger, D. R., 1965. An introduction to polyspectra. *Ann. Math. Statist.* **36** 1351–1374
- [12] Brillinger, D. R., 1965. A moving average representation for random variables covariance stationary on a finite time interval. *Biometrika* **52** 295–297
- [13] Brillinger, D., 1966. The application of the jackknife to the analysis of sample surveys. *Commentary. The Journal of the Market Research Society* **8** 74–80
- [14] Brillinger, D. R., 1966. The analyticity of the roots of a polynomial as functions of the coefficients. *Mathematics Magazine* **39** 145–147

- [15] Brillinger, D. R., 1966. An extremal property of the conditional expectation. *Biometrika* **53** 594–595
- [16] Brillinger, D. R., 1967. Bounded polymeasures and associated translation commutative polynomial operators. *Proc. Amer. Math. Soc.* **18** 487–491
- [17] Brillinger, D. R. and Rosenblatt, M., 1967. Asymptotic theory of estimates of  $k$ -th order spectra. In Harris, B. (ed.), *Advanced Seminar on Spectral Analysis of Time Series (Madison, WI, 1966)*, 153–188. John Wiley, New York, NY
- [18] Brillinger, D. R. and Rosenblatt, M., 1967. Asymptotic theory of estimates of  $k$ th-order spectra. *Proc. Natl. Acad. Sci. U.S.A.* **57** 206–210
- [19] Brillinger, D. R. and Rosenblatt, M., 1967. Computation and interpretation of  $k$ -th order spectra. In Harris, B. (ed.), *Advanced Seminar on Spectral Analysis of Time Series (Proc. Advanced Sem., Madison, Wis., 1966)*, 189–232. John Wiley, New York
- [20] Brillinger, D. R., 1968. Estimation of the cross-spectrum of a stationary bivariate Gaussian process from its zeros. *J. Roy. Statist. Soc. Ser. B* **30** 145–159
- [21] Brillinger, D., 1969. The calculation of cumulants via conditioning. *Ann. Inst. Stat. Math.* **21** 215–218
- [22] Brillinger, D., 1969. A search for a relationship between monthly sunspot numbers and certain climatic series. In *Bulletin of the International Statistical Institute. Volume 43, Book 1*, 293–307. International Statistical Institute
- [23] Brillinger, D. R., 1969. Asymptotic properties of spectral estimates of second order. *Biometrika* **56** 375–390
- [24] Brillinger, D. R., 1969. An asymptotic representation of the sample distribution function. *Bull. Amer. Math. Soc.* **75** 545–547
- [25] Brillinger, D. R., 1969. The canonical analysis of stationary time series. In Krishnaiah, P. (ed.), *Multivariate Analysis, II (Dayton, OH, 1968)*, 331–350. Academic Press, New York, NY
- [26] Brillinger, D. R. and Hatanaka, M., 1969. An harmonic analysis of non-stationary multivariate economic processes. *Econometrica* **37** 131–141
- [27] Brillinger, D., 1970. The identification of polynomial systems by means of higher order spectra. *Journal of Sound and Vibration* **12** 301–313

- [28] Brillinger, D. and Hatanaka, M., 1970. A permanent income hypothesis relating to the aggregate demand for money (an application of spectral and moving spectral analysis). *Economic Studies Quarterly* **21** 44–71
- [29] Brillinger, D. R., 1970. The frequency analysis of relations between stationary spatial series. In Pyke, R. (ed.), *Proceedings of the Twelfth Biennial Seminar of the Canadian Mathematical Congress on Time Series and Stochastic Processes. Convexity and Combinatorics (Vancouver, BC, 1969)*, 39–81. Canadian Mathematical Society, Ottawa
- [30] Brillinger, D. R., 1972. On the number of solutions of systems of random equations. *Ann. Math. Statist.* **43** 534–540
- [31] Brillinger, D. R., 1972. The spectral analysis of stationary interval functions. In Le Cam, L., Neyman, J. and Scott, E. (eds.), *Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability (Berkeley, CA, 1970/1971)*, vol. 1, 483–513. University of California Press, Berkeley, CA
- [32] Brillinger, D., 1973. An empirical investigation of the Chandler wobble and two proposed excitation processes. In *Bulletin of the International Statistical Institute. 39th Session: Vienna 1973. Book 3*, 413–434. International Statistical Institute
- [33] Brillinger, D., 1973. A power spectral estimate insensitive to transients. *Technometrics* **15** 559–562
- [34] Brillinger, D. R., 1973. The analysis of time series collected in an experimental design. In Krishnaiah, P. (ed.), *Multivariate analysis, III (Dayton, OH, 1972)*, 241–256. Academic Press, New York, NY
- [35] Brillinger, D. R., 1973. Estimation of the mean of a stationary time series by sampling. *J. Appl. Probab.* **10** 419–431
- [36] Brillinger, D. R., 1974. The asymptotic distribution of the Whittaker periodogram and a related chi-squared statistic for stationary processes. *Biometrika* **61** 419–422
- [37] Brillinger, D. R., 1974. Cross-spectral analysis of processes with stationary increments including the stationary  $G/G/\infty$  queue. *Ann. Probab.* **2** 815–827
- [38] Brillinger, D. R., 1974. Fourier analysis of stationary processes. *Proc. IEEE* **62** 1628–1643
- [39] Brillinger, D. R., 1974. *Time Series: Data Analysis and Theory*. International Series in Decision Processes. Holt, Rinehart and Winston, New York, NY

- [40] Brillinger, D., 1975. Estimation of product densities. In Frane, J. (ed.), *Computer Science and Statistics: 8th Annual Symposium*, 431–438. University of California
- [41] Brillinger, D., Bryant, H. and Segundo, J., 1975. Identification of synaptic operators. In McCann, G. and Marmarelis, P. (eds.), *Proceedings of the First Symposium on Testing and Identification of Nonlinear Systems*, 221–226. California Institute of Technology, Pasadena, CA
- [42] Brillinger, D. R., 1975. The identification of point process systems. *Ann. Probability* **3** 909–929
- [43] Brillinger, D. R., 1975. Statistical inference for stationary point processes. In Puri, M. (ed.), *Stochastic Processes and Related Topics (Bloomington, IN, 1974)*, vol. 1, 55–99. Academic Press, New York, NY
- [44] Brillinger, D., 1976. Approximate estimation of the standard errors of complex statistics based on sample surveys. *New Zealand Statistician* **11** 35–41
- [45] Brillinger, D., 1976. Some history of the data analysis of time series in the united states. In Owen, D. (ed.), *On the History of Statistics and Probability*, 267–280. Marcel Dekker, New York, NY
- [46] Brillinger, D., Bryant, H. and Segundo, J., 1976. Identification of synaptic interactions. *Biological Cybernetics* **22** 213–228
- [47] Brillinger, D. R., 1976. Estimation of the second-order intensities of a bivariate stationary point process. *J. Roy. Statist. Soc. Ser. B* **38** 60–66
- [48] Brillinger, D. R., 1976. Measuring the association of point processes: a case history. *Amer. Math. Monthly* **83** 16–22
- [49] Brillinger, D. R., 1977. The identification of a particular nonlinear time series system. *Biometrika* **64** 509–515
- [50] Brillinger, D., 1978. A note on the estimation of evoked response. *Biological Cybernetics* **31** 141–144
- [51] Brillinger, D., Jones, L. and Tukey, J., 1978. The role of statistics in weather resources management. Tech. Rep. II, Weather Modification Advisory Board, U.S. Department of Commerce, Washington, DC. U.S. Government Printing Office No. 003-0180-0091-1
- [52] Brillinger, D., Udias, A. and Bolt, B., 1978. Un modelo probabilístico para la determinación del mecanismo region de los terremotos. In *II Asamblea de la Unión Geodésica y Geofísica, Barcelona*, 637–640. IGN, Madrid

- [53] Brillinger, D. R., 1978. Comparative aspects of the study of ordinary time series and of point processes. In Krishnaiah, P. (ed.), *Developments in statistics, Vol. 1*, 33–133. Academic Press, New York, NY
- [54] Brillinger, D. R., 1978. Henry Scheffé, 1907–1977. *J. Roy. Statist. Soc. Ser. A* **141** 406–407
- [55] Brillinger, D. R., 1978. A note on a representation for the Gauss-Poisson process. *Stochastic Process. Appl.* **6** 135–137
- [56] Lee, W. and Brillinger, D., 1978. A point process analysis of Chinese earthquake history. In *Proc. Conf. Seismic Gaps*. MIT Press, Cambridge, MA
- [57] Silveria, W. and Brillinger, D., 1978. On the maximum wave heights in severe seas. In *Tenth Annual Offshore Technology Conference (Houston, TX, 1978)*, 1563–1568. Conference Paper no. 3232
- [58] Bolt, B. and Brillinger, D., 1979. Estimation of uncertainties in eigen-spectral estimates from decaying geophysical time series. *Geophys. J. Roy. Astron. Soc.* **59** 593–603
- [59] Brillinger, D., 1979. Confidence intervals for the cross covariance function. In Behara, M., Blyth, C., Campbell, L., Csörgő, M., Dawson, D., Giri, N., Joffe, A., Stanton, R. and Theodorescu, R. (eds.), *Mathematical Statistics*, vol. 5 of *Selecta Statistica Canadiana*, 1–16. Department of Mathematics, McMaster University, Hamilton, ON
- [60] Brillinger, D. and Segundo, J., 1979. Empirical examination of the threshold model of neuron firing. *Biological Cybernetics* **35** 213–220
- [61] Brillinger, D. R., 1979. Analyzing point processes subjected to random deletions. *Canad. J. Statist.* **7** 21–27
- [62] Brillinger, D. R., 1979. A continuous form of post-stratification. *Ann. Inst. Statist. Math.* **31** 271–277
- [63] Hung, G., Brillinger, D. and Stark, L., 1979. Interpretation of kernels. ii. same signed 1st- and 2nd- degree (main-diagonal) kernels of the human pupillary system. *Math. Biosci.* **46** 159–187
- [64] Lee, W. and Brillinger, D., 1979. On Chinese earthquake history - an attempt to model an incomplete data set by point process analysis. *Pure and Applied Geophysics* **117** 1229–1257
- [65] Brillinger, D., 1980. *Vremennye ryady. Obrabotka dannykh i teoriya*. Mir, Moscow. Russian translation of first edition of Time Series: Data Analysis and Theory (Expanded Edition) Holden-Day Inc., San Francisco (1981)

- [66] Brillinger, D., Guckenheimer, J., Guttorp, P. and Oster, G., 1980. Empirical modelling of population time series data: The case of age and density dependent vital rates. In Oster, G. F. (ed.), *Some Mathematical Questions in Biology, 14th Symposium (San Francisco, 1980)*, vol. 13 of *Lectures on Mathematics in the Life Sciences*, 65–90. American Mathematical Society, Providence, RI
- [67] Brillinger, D. and Tiao, G. (eds.), 1980. *Directions in time series. Proceedings of the IMS Special Topics Meeting on Time Series Analysis (Ames, IA, 1978.)*. Institute of Mathematical Statistics, Hayward, CA
- [68] Brillinger, D., Udias, A. and Bolt, B., 1980. A probability model for regional focal mechanism solutions. *Bul. Seismol. Soc. Amer.* **70** 149–170
- [69] Brillinger, D. R., 1980. Analysis of variance problems under time series models. In Krishnaiah, P. R. (ed.), *Analysis of Variance*, vol. 1 of *Handbook of Statistics*, 237–277. North-Holland, Amsterdam
- [70] Brillinger, D. R., 1980. The comparison of least squares and third-order periodogram procedures in the estimation of bifrequency. *J. Time Ser. Anal.* **1** 95–102
- [71] Brillinger, D. R. and Tiao, G. C. (eds.), 1980. *Directions in time series*. Institute of Mathematical Statistics, Hayward, CA
- [72] Brillinger, D. R. and Tiao, G. C. (eds.), 1980. *Directions in time series*. Institute of Mathematical Statistics, Hayward, Calif.
- [73] Udias, A., Buforn, E., Brillinger, D. and Bolt, B., 1980. A numerical method for individual and regional fault plane determinations. *Publ. Inst. Geophys. Pol. Acad. Sc.* **A-10** 87–94
- [74] Brillinger, D., 1981. Problem 6372. *Amer. Math. Monthly* **88** 769
- [75] Brillinger, D. R., 1981. The general linear model in the design and analysis of evoked response experiments. *J. Theoret. Neurobiol.* **1** 105–119
- [76] Brillinger, D. R., 1981. The key role of tapering in spectrum estimation. *IEEE Trans. Acoust., Speech, Signal Processing* **29** 1075–1076. Reprinted in Carter, G.C. (ed.), *Coherence and Time Delay Estimation* (IEEE, 1993) 37–38
- [77] Brillinger, D. R., 1981. Some aspects of modern population mathematics. *Canad. J. Statist.* **9** 173–194
- [78] Brillinger, D. R., 1981. Some aspects of the analysis of evoked response experiments. In Csörgö, M., Dawson, D., Rao, J. and Saleh, A. (eds.), *Statistics and related topics (Ottawa, ON, 1980)*, 155–168. North-Holland, Amsterdam



- [79] Brillinger, D. R., 1981. *Time Series: Data Analysis and Theory*. Holden-Day, San Francisco, CA, expanded edition edn.
- [80] Brillinger, D., 1982. Seismic risk assessment: some statistical aspects. *Journal of Earthquake Prediction Research* **1** 183–195
- [81] Brillinger, D., 1982. Some contrasting examples of the time and frequency domain approaches to time series analysis. In El-Shaarawi, A. and Esterby, S. (eds.), *Time Series Methods in Hydrosociences (Burlington, ON, 1981)*, 1–15. Elsevier, Amsterdam
- [82] Brillinger, D. R., 1982. Asymptotic normality of finite Fourier transforms of stationary generalized processes. *J. Multivariate Anal.* **12** 64–71
- [83] Brillinger, D. R., 1982. A generalized linear model with “Gaussian” regressor variables. In Bickel, P. J., Doksum, K. and Hodges, J., Jr. (eds.), *A Festschrift for Erich L. Lehmann*, Wadsworth Statistics/Probability Series, 97–114. Chapman & Hall/CRC
- [84] Brillinger, D. R., 1982. Some bounds for seismic risk. *Bull. Seismol. Soc. Amer.* **72** 1403–1410
- [85] Comis, J., Marg, E., Brillinger, D., Rudiak, D. and Keller, E., 1982. Comparison of means and medians in the reduction of visual evoked potential data. In Riddle, W. (ed.), *Proceedings of the Fifteenth Hawaii International Conference on System Sciences*, vol. 2, 242–253. Western Periodicals
- [86] Udias, A., Buforn, E., Brillinger, D. and Bolt, B., 1982. Joint statistical determination of fault plane parameters. *Physics of Earth and Planetary Interiors* **30** 178–184
- [87] Brillinger, D., 1983. Jump processes. In *Encyclopedia of Statistical Sciences*, vol. 4, 336–338. John Wiley and Sons, New York, NY
- [88] Brillinger, D., 1983. Statistics in fertility research: value and limitations. Tech. Rep. 19, Committee on Population and Demography, National Research Council
- [89] Brillinger, D. R., 1983. The finite Fourier transform of a stationary process. In Brillinger, D. and Krishnaiah, P. (eds.), *Time Series in the Frequency Domain*, vol. 3 of *Handbook of Statistics*, 21–37. Elsevier, Amsterdam. This constitutes Chapter 2 of the book.
- [90] Brillinger, D. R., 1983. The finite Fourier transform of a stationary process. In *Time series in the frequency domain*, vol. 3 of *Handbook of Statist.*, 21–37. North-Holland, Amsterdam

- [91] Brillinger, D. R. and Krishnaiah, P. R. (eds.), 1983. *Time series in the frequency domain*, vol. 3 of *Handbook of Statistics*. North-Holland Publishing Co., Amsterdam
- [92] Brillinger, D. R. and Preisler, H. K., 1983. Maximum likelihood estimation in a latent variable problem. In Karlin, S., Amemiya, T. and Goodman, L. (eds.), *Studies in Econometrics, Time Series, and Multivariate Statistics*, 31–65. Academic Press, New York, NY
- [93] Brillinger, D., 1984. Tukey’s work on time series analysis. In Brillinger, D. (ed.), *The Collected Works of J.W. Tukey*, vol. 1, xliii–xlvi. Chapman & Hall, London
- [94] Brillinger, D. and Preisler, H., 1984. An exploratory analysis of the Joyner-Boore attenuation data. *Bull. Seismol. Soc. America* **74** 1441–1450
- [95] Brillinger, D. R., 1984. Statistical inference for irregularly observed processes. In Parzen, E. (ed.), *Time Series Analysis of Irregularly Observed Data (College Station, TX, 1983)*, vol. 25 of *Lecture Notes in Statistics*, 38–57. Springer, New York, NY
- [96] Brillinger, D. R., 1984. Statistical inference for random processes. In *Proceedings of the International Congress of Mathematicians, Vol. 1, 2 (Warsaw, 1983)*, 1049–1061. PWN, Warsaw
- [97] Tukey, J. W., 1984. *The collected works of John W. Tukey. Vol. I*. Wadsworth Statistics/Probability Series. Wadsworth Advanced Books and Software, Belmont, CA. Time series: 1949–1964, Edited and with commentary by David R. Brillinger, With introductory material by William S. Cleveland and Frederick Mosteller
- [98] Tukey, J. W., 1984. *The collected works of John W. Tukey. Vol. II*. Wadsworth Statistics/Probability Series. Wadsworth Advanced Books and Software, Belmont, CA. Time series: 1965–1984, Edited and with commentary by David R. Brillinger, With introductory material by William S. Cleveland and Frederick Mosteller
- [99] Brillinger, D., 1985. Fourier inference: some methods for the analysis of array and nongaussian series data. *Journal of the American Water Resources Association* **21** 743–756
- [100] Brillinger, D., 1985. A maximum likelihood approach to frequency-wavenumber analysis. *IEEE Trans. Acoustics, Speech, Signal Processing* **33** 1076–1085
- [101] Brillinger, D., 1985. Some statistical aspects of nmr spectroscopy. In *Actas del Segundo Congreso Latinoamericano de Probabilidad y Estadística Matemática, Caracas*, 9–17

- [102] Brillinger, D., 1985. Statistics. In *New Canadian Encyclopedia*, 1754. Hurtig
- [103] Brillinger, D. and Preisler, H., 1985. Further analysis of the Joyner-Boore attenuation data. *Bull. Seismol. Soc. America* **75** 611–614
- [104] Brillinger, D. and Tukey, J., 1985. Spectrum analysis in the presence of noise: some issues and examples. In Brillinger, D. (ed.), *The Collected Works of J.W. Tukey*, vol. 2, 1001–1141. Chapman & Hall, London
- [105] Brillinger, D. and Preisler, H., 1986. Two examples of quantal data analysis: a) multivariate point process b) pure death process in an experimental design. In *Proceedings of the 13th International Biometric Conference, Seattle*, 94–113
- [106] Brillinger, D. R., 1986. The natural variability of vital rates and associated statistics. *Biometrics* **42** 693–734
- [107] Brillinger, D. R., 1986. Regression for randomly sampled spatial series: the trigonometric case. *J. Appl. Probab.* **23A** 275–289
- [108] Brillinger, D. R., 1986. What do seismology and neurophysiology have in common? - Statistics! *C. R. Math. Rep. Acad. Sci. Canada* **8** 1–11
- [109] Brillinger, D., 1987. Analysing interacting nerve cell spike trains to assess causal connections. In Marmarelis, V. (ed.), *Advanced Methods of Physiological System Modeling*, vol. 1, 29–40. University of Southern California, Biomedical
- [110] Brillinger, D., 1987. Fitting cosines: some procedures and some physical examples. In MacNeill, I. and Umphrey, G. (eds.), *Applied Probability, Stochastic Processes, and Sampling Theory*, vol. 1 of *Advances in the Statistical Sciences: Festschrift in Honor of Professor V.M. Joshi*, 75–100. D. Reidel, Boston, MA
- [111] Brillinger, D., 1987. Statistiques. In *L'encyclopedie du Canada*, 1871. Hurtig. Translation of Statistics, *New Canadian Encyclopedia*, Hurtig (1985), p. 1754.
- [112] Bloomfield, P., Brillinger, D., Nychka, D. and Stolarski, R., 1988. Statistical approaches to ozone trend detection. Tech. Rep. 18, World Meteorological Organization. Appendix A of "Report of the International Ozone Trends Panel" (WMO technical report)
- [113] Brillinger, D., 1988. An elementary trend analysis of Rio Negro levels at Manaus, 1903-1985. *Revista Brasileira de Probabilidade e Estatística* **2** 63–79

- [114] Brillinger, D., 1988. Maximum likelihood analysis of spike trains of interacting nerve cells. *Biological Cybernetics* **59** 189–200
- [115] Brillinger, D. R., 1988. The maximum likelihood approach to the identification of neuronal firing systems. *Annals of Biomedical Engineering* **16** 3–16
- [116] Brillinger, D. R., 1988. Some statistical methods for random process data from seismology and neurophysiology (in the 1983 wald memorial lectures). *Ann. Statist.* **16** 1–54
- [117] Brillinger, D., 1989. Estimating the chances of large earthquakes by radiocarbon dating and statistical modelling. In Tanur, J. M., Mosteller, F., Kruskal, W. H., Lehmann, E. L., Link, R. F., Pieters, R. S. and Rising, G. R. (eds.), *Statistics: A Guide to the Unknown*, 249–260. Wadsworth & Brooks/Cole, 3rd ed. edn.
- [118] Brillinger, D., 1989. Parameter estimation for nongaussian processes via second and third order spectra with an application to some endocrine data. In Marmarelis, V. (ed.), *Advanced Methods of Physiological System Modeling*, 53–61. Plenum, New York, NY
- [119] Brillinger, D., 1989. Some examples of the statistical analysis of seismological data. In Litehiser, J. (ed.), *Observatory Seismology: A Centennial Symposium for the Berkeley Seismographic Stations*, 266–278. University of California Press, Berkeley, CA
- [120] Brillinger, D., Downing, K., Glaeser, R. and Perkins, G., 1989. Combining noisy images of small crystalline domains in high resolution electron microscopy. *J. Appl. Stat.* **16** 165–175
- [121] Brillinger, D. R., 1989. Consistent detection of a monotonic trend superposed on a stationary time series. *Biometrika* **76** 23–30
- [122] Rosenberg, J., Amjad, A., Breeze, P., Brillinger, D. and Halliday, D., 1989. The Fourier approach to the identification of functional coupling between neuronal spike trains. *Prog. Biophys. Mol. Biol.* **53** 1–31
- [123] Sieh, K., Stuiver, M. and Brillinger, D., 1989. A more precise chronology of earthquakes produced by the San Andreas Fault in Southern California. *J. Geophys. Res.* **94** 603–623. Reprinted in Pipkin, B. and Proctor, R.J., eds., *Engineering Geology Practice in Southern California* (Star, 1992)
- [124] Brillinger, D., 1990. Mapping aggregate birth data. In Singh, A. and Whitridge, P. (eds.), *Analysis of Data in Time. Proceedings of the 1989 International Symposium*, 77–83. Statistics Canada, Ottawa

- [125] Brillinger, D., 1990. Spatial-temporal modelling of spatially aggregate birth data. *Survey Methodology* **16** 255–269
- [126] Brillinger, D., 1990. A study of second-and-third-order spectral procedures and maximum likelihood in the identification of a bilinear system. *IEEE Trans. Acoustics, Speech, and Signal Processing* **38** 1238–1245
- [127] Brillinger, D. R., Downing, K. H. and Glaeser, R. M., 1990. Some statistical aspects of low-dose electron imaging of crystals. *J. Statist. Plann. Inference* **25** 235–259
- [128] Brillinger, D., 1991. Basic aspects of higher-order spectra and some of their uses. In Lacoume, J. (ed.), *Higher Order Statistics: Proceedings of the International Signal Processing Workshop on Higher Order Statistics (Chamrousse, France, 1991)*, 7–16. CEPHAG, Saint Martin d’Herès, France. Reprinted in Lacoume, J.L. (ed.), *Higher Order Statistics* (Elsevier, 1992)
- [129] Brillinger, D. R., 1991. Some asymptotics of finite Fourier transforms of a stationary  $p$ -adic process. *J. Combin. Inform. System Sci.* **16** 155–169
- [130] Brillinger, D. R., 1991. Some history of the study of higher-order moments and spectra. *Statist. Sinica* **1** 465–476
- [131] Stoffer, D. S., 1991. Walsh-Fourier analysis and its statistical applications. *J. Amer. Statist. Assoc.* **86** 461–485. With comments by K. G. Beauchamp, David R. Brillinger and Pedro A. Morettin and a rejoinder by the author
- [132] Brillinger, D., 1992. Locally weighted analysis of spatially aggregate birth data: uncertainty estimation and display. In *Spatial Issues in Statistics (Proceedings of Statistics Canada Symposium 91)*, 71–79. Statistics Canada, Ottawa
- [133] Brillinger, D., 1992. Moments, cumulants and some applications to stationary random process. In Purdue, P. and Solomon, H. (eds.), *Proceedings of the Conference on Moments and Signal Processing, March, 1992 (Monterey, CA)*, 108–126. Stanford University Department of Statistics. This volume of proceedings is Technical Report No. 459, dated 1992-09-21, prepared under contract N00014-92-J-1264 (NR-042-267) for the Office of Naval Research
- [134] Brillinger, D., 1992. Nerve cell spike train data analysis: a progression of technique. *J. Amer. Statist. Assoc.* **87** 260–271. 1991 R.A. Fisher Memorial Lecture

- [135] Brillinger, D., Caines, P., Geweke, J., Parzen, E., Rosenblatt, M. and Taqqu, M. S. (eds.), 1992. *New directions in time series analysis. Part II (Minneapolis, MN, 1990)*, vol. 46 of *IMA Volumes in Mathematics and its Applications*. Springer-Verlag, New York, NY
- [136] Brillinger, D. and Kaiser, R., 1992. Fourier and likelihood analysis in nmr spectroscopy. In Brillinger, D., Caines, P., Geweke, J., Parzen, E., Rosenblatt, M. and Taqqu, M. (eds.), *New Directions in Time Series Analysis, Part I*, vol. 45 of *The IMA Volumes in Mathematics and its Applications*, 41–64. Springer-Verlag, New York, NY
- [137] Brillinger, D. R. and Kaiser, R., 1992. Fourier and likelihood analysis in NMR spectroscopy. In *New directions in time series analysis, Part I*, vol. 45 of *IMA Vol. Math. Appl.*, 41–64. Springer, New York
- [138] Brillinger, D., 1993. An application of statistics to seismology: dispersion and modes. In Subba Rao, T. (ed.), *Developments in Time Series Analysis: In Honour of Maurice B. Priestley*, 331–340. Chapman & Hall/CRC Press, London
- [139] Brillinger, D., 1993. Distribution of particle displacements via higher-order moment functions. *IEE Proc. F* **140** 390–394
- [140] Brillinger, D., 1993. Earthquake risk and insurance. *Environmetrics* **4** 1–21
- [141] Brillinger, D., 1993. Some examples of statistical analysis and computing in science. In *Computing Science and Statistics: Proceedings of the 25th Symposium of the Interface (San Diego, CA, 1993)*, 1–13. Interface Foundation, Fairfax Station, VA. Keynote talk
- [142] Brillinger, D. R., 1993. Comparative aspects of the analysis of stationary time series, point processes and hybrids. *Resenhas* **1** 263–282
- [143] Brillinger, D. R., 1993. The digital rainbow: some history and applications of numerical spectrum analysis. *Canad. J. Statist.* **21** 1–19
- [144] Brillinger, D., 1994. Examples of scientific problems and data analyses in demography, neurophysiology and seismology. *J. Computational and Graphical Statistics* **3** 239–249
- [145] Brillinger, D., 1994. Some basic aspects and uses of higher-order spectra. *Signal Processing* **36** 239–249
- [146] Brillinger, D., 1994. Some river wavelets. *Environmetrics* **5** 211–220
- [147] Brillinger, D., 1994. Trend analysis: time series and point process problems. *Environmetrics* **5** 1–19. Also in Proc. Stochastic and Statistical Methods in Hydrology and Environmental Engineering (Kluwer, 1994)