

Bibliography

- [1] Y. Aharonov, J. Oppenheim, S. Popescu, B. Reznik, W.G. Unruh, Phys. Rev. A, **57**, 4130, 1998 (quant-ph/9709031).
- [2] J. Oppenheim, B. Reznik, W.G. Unruh, quant-ph/9801034, submitted to Phys. Rev. A
- [3] J. Oppenheim, B. Reznik, W.G. Unruh When Does a Measurement or Event Occur? (quant-ph/9805064) To be published in Found. Phys
- [4] J. Oppenheim, B. Reznik, W.G. Unruh, Phys. Rev. A **59** 1804 (1999) quant-ph/9801034
- [5] J. Oppenheim, B. Reznik, W.G. Unruh, "Time as an Observable", in Proceedings of the 10th Max Born Symposium, eds. Ph. Blanchard, A. Jadczyk, Wroclaw - Sept., 1997, Springer-Verlag, Lecture Notes in Physics; quant-ph/9807058
- [6] J. Oppenheim, "Quantum Time", to be published in Proceedings of the Canadian General Relativity and Relativistic Astrophysics Conference, 1999
- [7] J. Oppenheim, B. Reznik, W.G. Unruh, "Temporal Ordering in Quantum Mechanics", submitted to Phys. Rev. A.
- [8] W. Pauli, *Die allgemeinen Prinzipien der Wellenmechanik*, in *Handbook of physics*, eds. H. Geiger and K. Schell, Vol. 24 Part 1, (Berlin, Springer Verlag), 1958.
- [9] N. Grot, C. Rovelli, R. S. Tate, Phys. Rev. **A54**, 4676 (1996), quant-ph/9603021.
- [10] Y. Aharonov and D. Bohm, Phys. Rev. D **122** 1649 (1961)
- [11] J. Kijowski, Rep. Math. Phys. **6**, 362 (1974)
- [12] For a review of recent developments on the arrival time problem see J.G. Muga, R. Sala, J.P. Palao (quant-ph/9801043).
Other recent works which consider modifications of the time-of-arrival operator include I. Egusquize, J. Muga, quant-ph (9905023); E. Galapon (quant-ph/9908033); A. Baute, R. Mayato, J. Palao, J. Muga, I. Egusquiza; quant-ph/9904055; J. Leon, J. Julve, P. Pitanga, F. de Urries, quant-ph/9903060; P. Kochanski, K. Wodkiewicz, quant-ph/9902044, to appear in Phys. Rev. A; L. Foschini, quant-ph/9901013; J. Finkelstein, quant-ph/9809085; J. Muga, C. Leavens, J. Palao, quant-ph/9807066,

- Phys. Rev. A.; J. Leon, J. Phys. A30 (1997) 4791 (quant-ph/9608013); V. Delgado and J. G. Muga, Phys. Rev. A **56**, 3425 (1997) (quant-ph/9704010). Ph. Blanchard, A. Jadczyk, quant-ph/9602010; Ph. Blanchard, A. Jadczyk, (quant-ph/9702019); V. Delgado, Phys. Rev. A **57** 762 (1988) (quant-ph/9709037); J.G. Muga, J.P. Palao, C.R. Leavens, (quant-ph/9803087) C.R. Leavens, "Time of arrival in quantum and Bohmian mechanics", Phys. Rev. A, **58**, 849, (1998); V. Olkhovsky, E. Recami, A. Gerasimchuk, Nuovo Cimento, **22** 263, 1974 and works contained therein.
- [13] R.S. Dumont, T.L. Marchioro II, Phys. Rev. A **47** 85 (1993); C.R. Leavens, Phys. Lett. A **178**, 27 (1993); W.R. MacKinnon, C.R. Leavens, Phys. Rev. A, **51** 2748 (1995); J.G. Muga, S. Brouard, D. Macias, Ann. Phys. (N.Y.) **240** 351 (1995); Ph. Blanchard, A. Jadczyk, quant-ph/9602010; V. Delgado, J.G. Muga, Phys. Rev. A **56** 3425 (1997) (quant-ph/9704010); V. Delgado, quant-ph/9709037
- [14] G.R. Allcock, Ann. Phys, **53**, 253 (1969)
- [15] G.R. Allcock, Ann. Phys, **53**, 286 (1969)
- [16] A. Peres, Am. J. Phys., **48**, 552 (1980).
- [17] For a review, see for example, R. Landauer, T. Martin Rev. Mod. Phys, **66** 217 (1994) or R.Y. Chiao and A.M. Steingberg, Progress in Optics 37, ed. E. Wolf (1998)
- [18] See for example, M. Gell-Mann and J.B. Hartle, in *Complexity, Entropy and the Physics of Information, SFI Studies in the Sciences of Complexity*, Vol. VIII, W. Zurek (ed.) (Addison Wesley, Reading, 1990); M. Gell-Mann and J.B. Hartle, Phys. Rev. D **47**, 3345 (1993); R.B. Griffiths, J. Stat. Phys. **36**, 219 (1984); R. Omnès, J. Stat. Phys **53**, 893 (1988)
- [19] J.J. Halliwell, E. Zafiris, Phys. Rev. D **57** 3351, (1998), (quant-ph/9706045); J.J. Halliwell, Prog. Th. Phys. Vol. 102, No. 4, quant-ph/9805057
- [20] For a discussion see:
W. G. Unruh, and R. M. Wald, *Phys.Rev.*, **D40** 2598 (1989).
For a good review of the subject, see
K.V. Kuchar, "Time and interpretations of quantum gravity", In Winnipeg 1991, Proceedings, General relativity and relativistic astrophysics 211-314 (this contains a good review of the problem(s) of time in general relativity and quantum gravity).
- [21] A Peres, WK Wootters: Phys Rev D32 (1985) 1968

- [22] See for example, C. Rovelli, Phys. Rev. D **42** 2638-2646 (1990); C. Rovelli, Phys. Rev. D **43**, 442 (1991)
- [23] J. von Neumann, *Mathematische Grundlagen der Quantenmechanik* (Springer, Berlin, 1932) p. 195, [English translation: *Mathematical Foundations of Quantum Mechanics*, trans E.T. Beyer (Princeton University Press, Princeton, 1995) p.366]; B. Misra and E.C.G. Sudarshan, J. Math. Phys. **18**, 756 (1977),
- [24] H. Salecker and E. P. Wigner, Phys. Rev. **109**, 571 (1958).
- [25] J.G. Muga, S. Brouard, and D. Macias, Ann. Phys, **240**, 351 (1995)
- [26] M. D. Srinivas and R. Vijayalakshmi, Pramana, **16**, 173 (1981); Holevo, A.S. (1982). Probabilistic and statistical aspects of quantum theory, North-Holland Publ, Amsterdam; P. Busch, M. Grabowski, P. Lahti, Phys Let A **191** 357 (1994); R. Giannitrapani, (quant-ph/9611015)
- [27] Y. Aharonov, B. Reznik, quant-ph/9704001
- [28] C. Rovelli, Found. Phys. **28** (1998) 1031-1043, quant-ph/902020
- [29] Bracken A.J. and Melloy G.F., J. Phys. A: Math. Gen **27** (1994) 2197
- [30] G. Muga, C.R. Leavens, J. Palao, Phys. Rev. A **58** (1998)
- [31] J.M. Jauch, J.P. Marchand, Helv. Phys. Acta **40** (1967), 217; F.T. Smith, Phys. Rev. **118**, 349
- [32] W.G. Unruh hep-th/9410168
- [33] B. Mielnik, Found. Phys. **24**, 1113 (1994)
- [34] V. Delgado, J.G. Muga, Phys. Rev. A **56** 3425 (1997)
- [35] J. Palao, J. Muga, R. Sala, Phys. Rev. Lett **80** (1998) 5469-5472; (quant-ph/9805035)
- [36] N. Yamada, S. Takagi Prog. Theor. Phys, **85**, 985 (1991); **86**, 599 (1991); **87**, 77 (1992)
- [37] C.R. Leavens, "Time of arrival in quantum and Bohmian mechanics", Phys. Rev. A **58**, 849 (1998)
- [38] E. Arthurs and J.L. Kelly, Bell Syst. Tech. J. **44**, 1153 (1965)
- [39] N. Margolus, L. Levitin, Physica D **120** (1998) 188-195, quant-ph/9710043
- [40] G. Unruh, and G.I. Opat, Am. J. Phys. **47**, 743 (1979)

- [41] This is rather well known, but the suggestion of using this idea on an unsuspecting cat was suggested to me by Benni Reznik (private communication).
- [42] Y. Aharonov and B. Reznik, "Weighing" a Closed System and the Time-energy Uncertainty Principle, quant-ph/9906030
- [43] Y. Aharonov, and D. Bohm, Phys. Rev. **122**, 1649 (1961)
- [44] Gradshteyn and Ryzhik, *Table of Integrals, Series, and Products*, 5th ed. (San Diego Academic Press Inc., 1963).
- [45] M. Reed and B. Simon, *Methods of Modern Mathematical Physics II: Fourier Analysis, Self-Adjointness*, New York, Academic Press, 1975.
- [46] Morse and Feshbach, *Methods of Theoretical Physics*, McGraw-Hill Book Company, New York, 1953