Phys. **5**, 241 (1986)].

[3] N. Arkani-Hamed, S. Dimopoulos and G. R. Dvali, Phys. Lett. B **429**, 263 (1998).

[4] See e. g.: M. B. Green, J. H. Schwarz and E. Witten, *Superstring Theory*, Vols. 1 and 2 (Cambridge University Press, Cambridge, 1987).

[5] T. Banks, W. Fischler, S. H. Shenker and L. Susskind, Phys. Rev. D **55**, 5112 (1997).

[6] This is different from the case of curved manifolds where closed time-like curves may arise under certain circumstances (famous examples are Gödel's rotating unviverse and Gott's geometry containing colliding cosmic strings). It has been argued, however, that such cases arise only due to the misidentification of different space-time points as identical points of the manifold [7]. Other authors have argued that the paradoxes arising from closed time-like curves are real, but can be resolved by an appropriate extension of the space-time manifold [8].

[7] F. I. Cooperstock and S. Tieu, Found. Phys. **35** (2005) 1497.

[8] S. Krasnikov, Phys. Rev. D **65**, 064013 (2002).

[9] I. Y. Aref'eva, T. Ishiwatari and I. V. Volovich, Theor. Math. Phys. **157**, 1646 (2008).

[10] F. J. Ynduráin, Phys. Lett. B **256**, 15 (1991).

[11] G. R. Dvali, G. Gabadadze and G. Senjanovic, arXiv:hep-ph/9910207 (published in: Shifman, M.A. (ed.): *The Many Faces of the Superworld* (World Scientific, 1999) p. 525).

[12] Even our four-dimensional universe is permeated by radiation with a finite temperature. However, the temperature of the cosmic background radiation is presently so low, $T_{\rm CBR} \approx 2.732$ K, that we can usually ignore its effects in particle physics experiments (an exception is the GKZ effect, which limits our ability to observe cosmic rays above a certain energy [13, 14]), and we can easily devise experimental conditions that shield the radiation. An exception are cosmic background neutrinos and gravitons which, however, have completely negligible interaction rates and thus can be ignored in any practical experiment.

[13] K. Greisen, Phys. Rev. Lett. **16**, 748 (1966).

[14] G. T. Zatsepin and V. A. Kuzmin, JETP Lett. **4**, 78 (1966) [Pisma Zh. Eksp. Teor. Fiz. **4**, 114 (1966)].

[15] J. G. Foster, *Physics with Two Time Dimensions*, Senior Thesis, Duke University, 2003 (unpublished).

[16] A. D. Sakharov, Sov. Phys. JETP **60**, 214 (1984) [Zh. Eksp. Teor. Fiz. **87**, 375 (1984)].

[17] I. Y. Aref'eva and I. V. Volovich, JETP Lett. **41**, 654 (1985) [Pisma Zh. Eksp. Teor. Fiz. **41**, 535 (1985)]; Phys. Lett. B **164**, 287 (1985).

[18] D. V. Anosov, *Geodesic flows on closed Riemannian manifolds with negative curvature*, Proc. Steklov Inst. Math. **90** (1967).

[19] I. Bars and C. Kounnas, Phys. Rev. D **56**, 3664 (1997) [arXiv:hep-th/9705205].

[20] I. Bars, C. Deliduman and O. Andreev, Phys. Rev. D **58**, 066004 (1998) [arXiv:hep-th/9803188].

[21] I. Bars, Phys. Rev. D **62**, 046007 (2000) [arXiv:hep-th/0003100].

[22] I. Bars, Phys. Rev. D **74**, 085019 (2006) [arXiv:hep-th/0606045].

[23] F. John, Duke Math. J. **4**, 300 (1938).

[24] G. Owens, Amer. Math. J. **69**, 184 (1947); *ibid.* **74**, 307 (1952).

[25] G. Owens, Duke Math. J. **9**, 272 (1942).

[26] T. Kobayashi and B. Ørsted, Adv. Math. **180**,551 (2003).

[27] L. Asgeirsson, Math. Ann. **113**, 321 (1936).

[28] R. Courant and D. Hilbert, *Methods of Mathematical Physics, Vol. 2: Partial Differential Equations*, (Interscience, 1962), Chapt. VI.17.

[29] M. Tegmark, Class. Quant. Grav. **14**, L69 (1997) [arXiv:gr-qc/9702052].

[30] W. Craig and S. Weinstein, Proc. Roy. Soc. A **465**, 3023 (2009).

[31] S. Weinstein, arXiv:0812.3869 [physics.gen-ph].

[32] D. Teaney, Phys. Rev. D **74**, 045025 (2006).

[33] P. Kovtun and A. Starinets, Phys. Rev. Lett. **96**, 131601 (2006).

[34] G. Policastro, D. T. Son and A. O. Starinets, Phys. Rev. Lett. **87**, 081601 (2001)

[35] P. Kovtun, D. T. Son and A. O. Starinets, Phys. Rev. Lett. **94**, 111601 (2005)

[36] S. S. Gubser, D. R. Gulotta, S. S. Pufu and F. D. Rocha, JHEP **0810**, 052 (2008).

[37] P. M. Chesler, K. Jensen, A. Karch and L. G. Yaffe, Phys. Rev. D **79**, 125015 (2009).

[38] Y. Hatta, E. Iancu and A. H. Mueller, JHEP **0805**, 037 (2008).

[39] P. M. Chesler, K. Jensen and A. Karch, Phys. Rev. D **79**, 025021 (2009).

[40] E. Witten, Adv. Theor. Math. Phys. **2**, 505 (1998).

[41] C. Csaki, H. Ooguri, Y. Oz and J. Terning, JHEP **9901**, 017 (1999).

[42] A. Hashimoto and Y. Oz, Nucl. Phys. B **548**, 167 (1999).

[43] S. Kuperstein and J. Sonnenschein, JHEP **0411**, 026 (2004).

[44] C. K. Wen and H. X. Yang, Mod. Phys. Lett. A **20**, 997 (2005).

[45] B. Cai, C. Wen and H. Yang, Mod. Phys. Lett. A **22**, 719 (2007).

[46] D. Bodeker, Phys. Lett. B **426**, 351 (1998).

[47] C. Beck, Nonlinearity **8**, 423 (1995).

[48] T. S. Biró, S. G. Matinyan and B. Müller, Found. Phys. Lett. **14**, 471 (2001).

[49] G. 't Hooft, arXiv:hep-th/0104219 [published in: *Quantum [Un]speakables: From Bell to Quantum Information*, R. A. Bertlmann and A. Zeilinger, (eds.), Springer-Verlag, p. 307].

[50] L. Susskind, J. Math. Phys. **36**, 6377 (1995).

[51] J. M. Maldacena, Adv. Theor. Math. Phys. **2**, 231 (1998) [Int. J. Theor. Phys. **38**, 1113 (1999)].

[52] A. E. Strominger, Annals Phys. **146**, 419 (1983).

[53] A. Iwazaki, Phys. Lett. B **141**, 342 (1984).

[54] D. J. E. Callaway and A. Rahman, Phys. Rev. Lett. **49**, 613 (1982).

[55] M. Namiki, I. Ohba, K. Okano and Y. Yamanaka, Prog. Theor. Phys. **69**, 1580 (1983).

[56] D. J. E. Callaway and A. Rahman, Phys. Rev. D **28**, 1506 (1983).

[57] A. Iwazaki, Phys. Rev. D **32**, 2756 (1985).

[58] A. Iwazaki, preprint LBL-20641 (1985).

[59] M. Fukugita, T. Kaneko and A. Ukawa, Nucl. Phys. B **270**, 365 (1986).

[60] G. Parisi and Y. s. Wu, Sci. Sin. **24**, 483 (1981).

[61] M. Namiki, I. Ohba, K. Okano, Y. Yamanaka, A. K. Kapoor, H. Nakazato and S. Tanaka, Lect. Notes Phys. **M9**, 1 (1992).

[62] M. Namiki, Prog. Theor. Phys. Suppl. **111**, 1 (1993).