Curriculum Vitae

Personal data

Name	Tomáš Brauner
Address	Department of Mathematics and Physics, Faculty of Science and Technology, University of Stavanger, 4036 Stavanger, Norway
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Nationality	Czech

Academic career

2016–	Professor, Department of Mathematics and Physics, Faculty of Science and Technology, University of Stavanger
2015–2016	Associate professor, Department of Mathematics and Physics, Faculty of Science and Technology, University of Stavanger
2014–2015	Senior postdoc, Institute for Theoretical Physics, Vienna University of Technology (15 months)
2013–2014	Postdoctoral scientist, Department of Physics, University of Helsinki (7 months)
2012–2019	Research scientist, Nuclear Physics Institute ASCR, Řež
2010–2013	Postdoctoral fellow, Faculty of Physics, Bielefeld University (36 months)
2009–2010	EMMI guest scientist, Institute for Theoretical Physics, Goethe University Frankfurt (16 months)
2007–2009	Humboldt research fellow, Institute for Theoretical Physics, Goethe University Frankfurt (22 months)
2006–2011	Postdoctoral research scientist, Nuclear Physics Institute ASCR, Řež
2002–2006	Research assistant, Nuclear Physics Institute ASCR, Řež
2001–2002	Research assistant, Institute of Physics ASCR, Prague

Education

2002–2006	Charles University in Prague, Faculty of Mathematics and Physics: **PhD degree** in Theoretical physics, astronomy and astrophysics (28 June 2006); thesis title "Spontaneous symmetry breaking in strong and electroweak interactions"
1997–2002	Charles University in Prague, Faculty of Mathematics and Physics: **Master degree** in Theoretical physics (*summa cum laude*, 7 June 2002); thesis title "Modern formulation of the theory of renormalization"

Student mentoring

2021–2022	*Tiyasa Kar*: supervision, **MSc thesis** (Surat)
2021	*Martin Mojahed*: collaboration, pre-PhD project based on 2 joint papers
2020–2021	*Martin Grønli*: co-supervision, **MSc thesis** (Trondheim) based on 1 joint paper
2020	*Liva Vangen*: supervision, **Bc thesis** (Stavanger)
2019	*Valter Batista*: supervision, **Bc thesis** (Stavanger)
2018–2019	*Chinedu Kevin Oramah*: supervision, **MSc thesis** (Stavanger)
2018	*Marius Holm*: supervision, **Bc thesis** (Stavanger)
2018–	*Georgios Filios*: supervision, ongoing, 2 joint papers
2016–2017	*Andreas Helset*: co-supervision, **MSc thesis** (Trondheim)
2016–2017	*Martin Jakobsen*: co-supervision, **MSc thesis** (Trondheim) based on 1 joint paper
2016–2017	*Saurabh Kadam*: supervision, pre-MSc project (Pune) based on 2 joint papers
2016	*Signe Gevik* and *Kristoffer Valentinsen*: supervision, **Bc thesis** (Stavanger)
2015–	*Mark Bogers*: supervision, ongoing, 2 joint papers
2010–2011	*Haruki Watanabe*: informal supervision, **MSc thesis** (Tokyo) based on 2 joint papers
2010–2011	*Sylvain Mogliacci*: informal supervision and work on a joint project
2009–2012	*Tian Zhang*: informal supervision, **PhD thesis** (Frankfurt) based on 2 joint papers
2008–2011	*Jin-yi Pang*: informal supervision, **MSc thesis** (Hefei) based on 2 joint papers
2006–2009	*Petr Beneš*: collaboration, **PhD thesis** (Prague) partially based on 3 joint papers

Teaching experience

September 2022	**Lecture course** on *Spontaneous symmetry breaking and Nambu-Goldstone bosons*, W. E. Heraeus Summer School "Saalburg" for Graduate Students on "Foundations and New Methods in Theoretical Physics"
fall 2021	**Lecture course** on *Analytical mechanics and field theory*, Faculty of Science and Technology, University of Stavanger
spring 2018	**Lecture course** on *QCD at finite density and temperature*, Faculty of Science and Technology, University of Stavanger
spring 2016–2017 **spring 2020–2022**	**Lecture course** on *electromagnetism and special relativity*, Faculty of Science and Technology, University of Stavanger
fall 2015–2018	**Lecture course** on *thermo- and fluid dynamics*, Faculty of Science and Technology, University of Stavanger
spring 2014	**Teaching assistant** for a lecture course on *applied quantum field theory*, Faculty of Science, University of Helsinki
fall 2012	**Lecture course** on *quantum mechanics*, Faculty of Physics, Bielefeld University
fall 2011	**Lecture course** on *electroweak interactions*, Faculty of Physics, Bielefeld University
fall 2010	**Teaching assistant** for a lecture course on *symmetries in physics*, Faculty of Physics, Bielefeld University
fall 2007	**Teaching assistant** for a lecture course on *quantum field theory*, Faculty of Physics, Frankfurt University
August 2007	**Discussion leader** at the European School of High-Energy Physics (2 weeks)
fall 2006	**Teaching assistant** for a lecture course on *quantum field theory*, Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University, Prague
fall 2005	**Teaching assistant** for a lecture course on *quantum field theory*, Faculty of Mathematics and Physics, Charles University, Prague
spring 2004, 2005 **fall 2003, 2004, 2006**	**Teaching assistant** for a lecture course on *quantum mechanics*, Faculty of Mathematics and Physics, Charles University, Prague
spring 2002	**Teaching assistant** for a lecture course on *mechanics* (theory classes and labs), Faculty of Civil Engineering, Czech Technical University, Prague

List of publications

Monographs

1. *Snowmass Theory Frontier: Effective Field Theory Topical Group Summary*, M. Baumgart et al., **chapter** in *Proceedings of the US Community Study on the Future of Particle Physics (Snowmass 2021)*, **arXiv:2210.03199 [hep-ph]**
2. *Effective Field Theories for Condensed Matter Systems*, T. Brauner, S. A. Hartnoll, P. Kovtun, H. Liu, M. Mezei, A. Nicolis, R. Penco, S.-H. Shao, D. T. Son, contribution to **chapter** of *Proceedings of the US Community Study on the Future of Particle Physics (Snowmass 2021)*, **arXiv:2203.10110 [hep-th]**
3. *Cold atomic gases*, T. Brauner, **chapter (50pp)** in *Low-temperature physics*, ed. L. Skrbek, Matfyzpress, Prague (2011), ISBN 9788073781682 (in Czech)
4. *Spontaneous symmetry breaking in strong and electroweak interactions*, T. Brauner, **PhD thesis**, supervised by Dr. J. Hošek, Charles University in Prague (2006); accompanied by articles listed below as no. 51, 52, 53, 55
5. *Modern formulation of the theory of renormalization*, T. Brauner, **diploma thesis** (in Czech), supervised by Prof. J. Niederle, Charles University in Prague (2002)

Research papers

1. *Fractional soft limits of scattering amplitudes*, T. Brauner, A. Esposito and R. Penco, **Phys. Rev. Lett. 128 (2022) 231601**, **IAS press release**
2. *Competition of chiral soliton lattice and Abrikosov vortex lattice in QCD with isospin chemical potential*, M. S. Grønli and T. Brauner, **Eur. Phys. J. C82 (2022) 354**
3. *Nonrelativistic effective field theories with enhanced symmetries and soft behavior*, M. A. Mojahed and T. Brauner, **JHEP 03 (2022) 086**
4. *Chiral soliton lattice phase in warm QCD*, T. Brauner, H. Kolešová and N. Yamamoto, **Phys. Lett. B823 (2021) 136767**
5. *On-shell recursion relations for nonrelativistic effective field theories*, M. A. Mojahed and T. Brauner, **Phys. Lett. B822 (2021) 136705**
6. *Field theories with higher-group symmetry from composite currents*, T. Brauner, **JHEP 04 (2021) 045**
7. *Remarks on relativistic scalar models with chemical potential*, T. Brauner, **arXiv:2009.08895 [hep-th]**
8. *Exceptional nonrelativistic effective field theories with enhanced symmetries*, T. Brauner, **JHEP 02 (2021) 218**
9. *Noether currents of locally equivalent symmetries*, T. Brauner, **Phys. Scr. 95 (2020) 035004**
10. *Thermodynamics of antiferromagnetic solids in magnetic fields*, T. Brauner and C. P. Hofmann, **Ann. Phys. 418 (2020) 168168**
11. *Chiral soliton lattice in QCD-like theories*, T. Brauner, G. Filios and H. Kolešová, **JHEP 12 (2019) 029**
12. *Anomaly-Induced Inhomogeneous Phase in Quark Matter without the Sign Problem*, T. Brauner, G. Filios and H. Kolešová, **Phys. Rev. Lett. 123 (2019) 012001**
13. *Gauged Wess-Zumino terms for a general coset space*, T. Brauner and H. Kolešová, **Nucl. Phys. B945 (2019) 114676**

14. *Helical spin texture in a thin film of superfluid ^3He*, T. Brauner and S. Moroz, **Phys. Rev. B99 (2019) 214506**

15. *Lie-algebraic classification of effective theories with enhanced soft limits*, M. P. Bogers and T. Brauner, **JHEP 05 (2018) 076**

16. *Geometry of Multiflavor Galileon-Like Theories*, M. P. Bogers and T. Brauner, **Phys. Rev. Lett. 121 (2018) 171602**

17. *Scattering amplitudes of massive Nambu–Goldstone bosons*, T. Brauner and M. F. Jakobsen, **Phys. Rev. D97 (2018) 025021**

18. *Two-loop free energy of three-dimensional antiferromagnets in external magnetic and staggered fields*, T. Brauner and C. P. Hofmann, **Ann. Phys. 386 (2017) 178–198**

19. *Anomalous low-temperature thermodynamics of QCD in strong magnetic fields*, T. Brauner and S. V. Kadam, **JHEP 11 (2017) 103**

20. *Anomalous electrodynamics of neutral pion matter in strong magnetic fields*, T. Brauner and S. V. Kadam, **JHEP 03 (2017) 015**

21. *Vector meson condensation in a pion superfluid*, T. Brauner and X.-G. Huang, **Phys. Rev. D94 (2016) 094003**

22. *Dimensional reduction of the Standard Model coupled to a new singlet scalar field*, T. Brauner, T. V. I. Tenkanen, A. Tranberg, A. Vuorinen, and D. J. Weir, **JHEP 03 (2017) 007**

23. *Chiral soliton lattice and charged pion condensation in strong magnetic fields*, T. Brauner and N. Yamamoto, **JHEP 04 (2017) 132**

24. *Confronting effective models for deconfinement in dense quark matter with lattice data*, J. O. Andersen, T. Brauner, and W. R. Naylor, **Phys. Rev. D92 (2015) 114504**, **Editors' Suggestion**

25. *Magneto-optics of massive Dirac fermions in bulk Bi_2Se_3*, M. Orlita *et al.*, **Phys. Rev. Lett. 114 (2015) 186401**

26. *General coordinate invariance in quantum many-body systems*, T. Brauner, S. Endlich, A. Monin, and R. Penco, **Phys. Rev. D90 (2014) 105016**, **Editors' Suggestion**

27. *Effective Lagrangians for quantum many-body systems*, J. O. Andersen, T. Brauner, C. P. Hofmann, and A. Vuorinen, **JHEP 08 (2014) 088**

28. *Topological interactions of Nambu-Goldstone bosons in quantum many-body systems*, T. Brauner and S. Moroz, **Phys. Rev. D90 (2014) 121701**, **Rapid Communication**

29. *Spontaneous breaking of spacetime symmetries and the inverse Higgs effect*, T. Brauner and H. Watanabe, **Phys. Rev. D89 (2014) 085004**

30. *Massive Nambu–Goldstone bosons*, H. Watanabe, T. Brauner, and H. Murayama, **Phys. Rev. Lett. 111 (2013) 021601**

31. *Computing the temperature dependence of effective CP violation in the standard model*, T. Brauner, O. Taanila, A. Tranberg, and A. Vuorinen, **JHEP 11 (2012) 076**

32. *How does color neutrality affect collective modes in color superconductors?*, H. Abuki and T. Brauner, **Phys. Rev. D85 (2012) 116004**

33. *Spontaneous breaking of continuous translational invariance*, H. Watanabe and T. Brauner, **Phys. Rev. D85 (2012) 085010**

34. *Two-color QCD via dimensional reduction*, T. Zhang, T. Brauner, A. Kurkela, and A. Vuorinen, **JHEP 02 (2012) 139**

35. *Temperature dependence of standard model CP violation*, T. Brauner, O. Taanila, A. Tranberg, and A. Vuorinen, **Phys. Rev. Lett. 108 (2012) 041601**, **Editors' Suggestion & *Physics* Synopsis**

36. *Number of Nambu–Goldstone bosons and its relation to charge densities*, H. Watanabe and T. Brauner, **Phys. Rev. D84 (2011) 125013**

37. *Spin-one color superconductors: Collective modes and effective Lagrangian*, J.-y. Pang, T. Brauner, and Q. Wang, **Nucl. Phys. A852 (2011) 175–196**

38. *QCD-like theories at nonzero temperature and density*, T. Zhang, T. Brauner, and D. H. Rischke, **JHEP 06 (2010) 064**

39. *Spontaneous symmetry breaking and Nambu–Goldstone bosons in quantum many-body systems*, T. Brauner, **Symmetry 2 (2010) 609–657**, **invited review**

40. *Phase diagram of two-color quark matter at nonzero baryon and isospin density*, J. O. Andersen and T. Brauner, **Phys. Rev. D81 (2010) 096004**

41. *Two-color quark matter:* $\mathrm{U}(1)_\mathrm{A}$ *restoration, superfluidity, and quarkyonic phase*, T. Brauner, K. Fukushima, and Y. Hidaka, **Phys. Rev. D80 (2009) 074035**

42. *Pion condensation in a dense neutrino gas*, H. Abuki, T. Brauner, and H. J. Warringa, **Eur. Phys. J. C64 (2009) 123–131**

43. *Helical ordering in the ground state of spin-one color superconductors as a consequence of parity violation*, T. Brauner, **Phys. Rev. D78 (2008) 125027**

44. *Strongly interacting Fermi systems in* $1/N$ *expansion: From cold atoms to color superconductivity*, H. Abuki and T. Brauner, **Phys. Rev. D78 (2008) 125010**

45. *Dynamical electroweak symmetry breaking due to strong Yukawa interactions*, P. Beneš, T. Brauner, and A. Smetana, **J. Phys. G36 (2009) 115004**

46. *Linear sigma model at finite density in the* $1/N$ *expansion to next-to-leading order*, J. O. Andersen and T. Brauner, **Phys. Rev. D78 (2008) 014030**

47. *BCS–BEC crossover in dense relativistic matter: Collective excitations*, T. Brauner, **Phys. Rev. D77 (2008) 096006**

48. *Goldstone bosons in presence of charge density*, T. Brauner, **Phys. Rev. D75 (2007) 105014**

49. *Spontaneous symmetry breaking in the linear sigma model at finite chemical potential: One-loop corrections*, T. Brauner, **Phys. Rev. D74 (2006) 085010**

50. *Dynamical breakdown of Abelian gauge chiral symmetry by strong Yukawa interactions*, P. Beneš, T. Brauner, and J. Hošek, **Phys. Rev. D75 (2007) 056003**

51. *On the chiral perturbation theory for two-flavor two-color QCD at finite chemical potential*, T. Brauner, **Mod. Phys. Lett. A21 (2006) 559–570**

52. *Goldstone boson counting in linear sigma models with chemical potential*, T. Brauner, **Phys. Rev. D72 (2005) 076002**

53. *Dynamical fermion mass generation by a strong Yukawa interaction*, T. Brauner and J. Hošek, **Phys. Rev. D72 (2005) 045007**

54. *A model of flavors*, T. Brauner and J. Hošek, **arXiv:hep-ph/0407339**

55. *Color superconductor with a color-sextet condensate*, T. Brauner, J. Hošek, and R. Sýkora, **Phys. Rev. D68 (2003) 094004**

Conference proceedings

1. *Dense matter in strong magnetic fields without nucleons*, T. Brauner, Conference "Quark Confinement and the Hadron Spectrum", Maynooth, 1–6 August 2018; **PoS (Confinement XIII) 201**
2. *Deconfinement in dense (two-color) matter*, T. Brauner, Workshop "Excited QCD", Tatranská Lomnica, 8–14 March 2015; **Acta Phys. Polon. Supp. 8 (2015) 471–476**
3. *QCD-like theories under extreme conditions*, T. Brauner, Workshop "Excited QCD", Sarajevo, 3–9 February 2013; **Acta Phys. Polon. Supp. 6 (2013) 941–946**
4. *Center-symmetric effective theory for two-color QCD at high and moderate temperature*, T. Brauner, Conference "Quark Confinement and the Hadron Spectrum", Munich, 8–12 October 2012; **PoS (Confinement X) 181**
5. *CP violation and electroweak baryogenesis in the Standard Model*, T. Brauner, International Conference on New Frontiers in Physics, Kolymbari, 10–16 June 2012; **EPJ Web Conf. 70 (2014) 00078**
6. *Center-symmetric effective theory for two-color quark matter*, T. Brauner, Workshop "Critical Point and Onset of Deconfinement", Wuhan, 7–11 November 2011; **Cent. Eur. J. Phys. 10 (2012) 1382–1384**
7. *CP violation and cold electroweak baryogenesis in the Standard Model (poster)*, T. Brauner, International Europhysics Conference on High Energy Physics, Grenoble, 21–27 July 2011; **PoS (EPS-HEP2011) 408**
8. *Center-symmetric effective theory for two-color QCD with massive quarks at nonzero chemical potential*, T. Brauner, International Europhysics Conference on High Energy Physics, Grenoble, 21–27 July 2011; **PoS (EPS-HEP2011) 315**
9. *Phase diagram of dense quark matter in QCD-like theories*, T. Brauner, Conference "Quark Confinement and the Hadron Spectrum", Madrid, 30 August–3 September 2010; **AIP Conf. Proc. 1343 (2011) 589–591**
10. *Symmetry breaking patterns and collective modes of spin-one color superconductors*, T. Brauner, J.-y. Pang, and Q. Wang, International Symposium on Symmetries in Subatomic Physics, Taipei, 2–5 June 2009; **Nucl. Phys. A844 (2010) 216–223**
11. *Thermodynamics of the pion gas using the $O(N)$ model in $1/N$ expansion*, T. Brauner, Conference "Quark Confinement and the Hadron Spectrum", Mainz, 1–6 September 2008; **PoS (Confinement8) 088**
12. *Goldstone boson counting in relativistic systems at finite density*, T. Brauner, International Conference on Quarks and Nuclear Physics, Madrid, 5–10 June 2006; **Eur. Phys. J. A31 (2007) 758–760**
13. *Dynamical breakdown of an Abelian gauge chiral symmetry by strong Yukawa couplings*, P. Beneš, T. Brauner, and J. Hošek, CP studies and non-standard Higgs physics, CERN, 14–16 December 2005; **CERN Yellow Report, pp 487–491**
14. *Dynamical symmetry breaking and mass generation*, T. Brauner and J. Hošek, Week of Doctoral Students, Prague, 6–9 June 2005; **Matfyzpress, Prague, 2005, ISBN 80-86732-59-2, pp. 436–441**
15. *Single-flavor color superconductivity with color-sextet pairing*, T. Brauner, Indian-Summer School "Understanding Dense Matter", Prague, 27 August–1 September 2003; **Czech. J. Phys. 55 (2005) 9–16**
16. *Color superconductor with a color-sextet condensate*, T. Brauner, International Europhysics Conference on High Energy Physics, Aachen, 17–23 July 2003; **Eur. Phys. J. C33 (2004) s597–s599**
17. *Color superconductivity with a color-sextet order parameter*, T. Brauner, Week of Doctoral Students, Prague, 10–13 June 2003; **Matfyzpress, Prague, 2003, ISBN 80-86732-18-5, pp. 544–549**