

Publications

Dr. rer. nat. Erik Schnetter

Publications in Refereed Journals

1. S. Brandt, R. Correll, R. Gomez, M. Huq, P. Laguna, L. Lehner, P. Marronetti, R. A. Matzner, D. Neilsen, J. Pullin, E. Schnetter, D. Shoemaker, and J. Winicour, *Grazing collisions of black holes via the excision of singularities*, Phys. Rev. Lett. **85**, 5496 (2000), arXiv:gr-qc/0009047, URL <http://arxiv.org/abs/gr-qc/0009047>.
2. B. Kelly, P. Laguna, K. Lockitch, J. Pullin, E. Schnetter, D. Shoemaker, and M. Tiglio, *A cure for unstable numerical evolutions of single black holes: adjusting the standard ADM equations*, Phys. Rev. D **64**, 084013 (2001), arXiv:gr-qc/0103099, URL <http://arxiv.org/abs/gr-qc/0103099>.
3. O. Dreyer, B. Krishnan, E. Schnetter, and D. Shoemaker, *Introduction to isolated horizons in numerical relativity*, Phys. Rev. D **67**, 024018 (2003), arXiv:gr-qc/0206008, URL <http://arxiv.org/abs/gr-qc/0206008>.
4. D. Shoemaker, K. Smith, U. Sperhake, P. Laguna, E. Schnetter, and D. R. Fiske, *Moving black holes via singularity excision*, Class. Quantum Grav. **20**, 3729 (2003), arXiv:gr-qc/0301111, URL <http://arxiv.org/abs/gr-qc/0301111>.
5. M. Alcubierre, G. Allen, C. Bona, D. Fiske, T. Goodale, F. S. Guzmán, I. Hawke, S. H. Hawley, S. Husa, M. Koppitz, C. Lechner, D. Pollney, D. Rideout, M. Salgado, E. Schnetter, E. Seidel, H. Shinkai, B. Szilágyi, D. Shoemaker, R. Takahashi, and J. Winicour, *Toward standard testbeds for numerical relativity*, Class. Quantum Grav. **21**, 589 (2004), arXiv:gr-qc/0305023, URL <http://arxiv.org/abs/gr-qc/0305023>.
6. E. Schnetter, *Finding apparent horizons and other two-surfaces of constant expansion*, Class. Quantum Grav. **20**, 4719 (2003), arXiv:gr-qc/0306006, URL <http://arxiv.org/abs/gr-qc/0306006>.
7. E. Schnetter, S. H. Hawley, and I. Hawke, *Evolutions in 3d numerical relativity using fixed mesh refinement*, Class. Quantum Grav. **21**, 1465 (2004), arXiv:gr-qc/0310042, URL <http://arxiv.org/abs/gr-qc/0310042>.
8. E. Schnetter, F. Herrmann, and D. Pollney, *Horizon pretracking*, Phys. Rev. D **71**, 044033 (2005), arXiv:gr-qc/0410081, URL <http://arxiv.org/abs/gr-qc/0410081>.
9. E. Evans, S. Iyer, E. Schnetter, W.-M. Suen, J. Tao, R. Wolfmeyer, and H.-M. Zhang, *Computational relativistic astrophysics with adaptive mesh refinement: Testbeds*, Phys. Rev. D **71**, 081301(R) (2005), arXiv:gr-qc/0501066, URL <http://arxiv.org/abs/gr-qc/0501066>.
10. B. Zink, N. Stergioulas, I. Hawke, C. D. Ott, E. Schnetter, and E. Müller, *Black hole formation through fragmentation of toroidal polytropes*, Phys. Rev. Lett. **96**, 161101 (2006), arXiv:gr-qc/0501080, URL <http://arxiv.org/abs/gr-qc/0501080>.

11. L. Baiotti, I. Hawke, L. Rezzolla, and E. Schnetter, *Gravitational-wave emission from rotating gravitational collapse in three dimensions*, Phys. Rev. Lett. **94**, 131101 (2005), arXiv:gr-qc/0503016, URL <http://arxiv.org/abs/gr-qc/0503016>.
12. U. Sperhake, B. Kelly, P. Laguna, K. L. Smith, and E. Schnetter, *Black hole head-on collisions and gravitational waves with fixed mesh-refinement and dynamic singularity excision*, Phys. Rev. D **71**, 124042 (2005), arXiv:gr-qc/0503071, URL <http://arxiv.org/abs/gr-qc/0503071>.
13. E. Schnetter and B. Krishnan, *Non-symmetric trapped surfaces in the Schwarzschild and Vaidya spacetimes*, Phys. Rev. D **73**, 021502(R) (2006), arXiv:gr-qc/0511017, URL <http://arxiv.org/abs/gr-qc/0511017>.
14. P. Diener, E. N. Dorband, E. Schnetter, and M. Tiglio, *Optimized high-order derivative and dissipation operators satisfying summation by parts, and applications in three-dimensional multi-block evolutions*, J. Sci. Comp. pp. 109–145 (2007), arXiv:gr-qc/0512001, URL <http://arxiv.org/abs/gr-qc/0512001>.
15. P. Diener, F. Herrmann, D. Pollney, E. Schnetter, E. Seidel, R. Takahashi, J. Thornburg, and J. Ventrella, *Accurate evolution of orbiting binary black holes*, Phys. Rev. Lett. **96**, 121101 (2006), arXiv:gr-qc/0512108, URL <http://arxiv.org/abs/gr-qc/0512108>.
16. E. Schnetter, P. Diener, E. N. Dorband, and M. Tiglio, *A multi-block infrastructure for three-dimensional time-dependent numerical relativity*, Class. Quantum Grav. **23**, S553 (2006), arXiv:gr-qc/0602104, URL <http://arxiv.org/abs/gr-qc/0602104>.
17. E. Schnetter, B. Krishnan, and F. Beyer, *Introduction to dynamical horizons in numerical relativity*, Phys. Rev. D **74**, 024028 (2006), arXiv:gr-qc/0604015, URL <http://arxiv.org/abs/gr-qc/0604015>.
18. E. N. Dorband, E. Berti, P. Diener, E. Schnetter, and M. Tiglio, *A numerical study of the quasi-normal mode excitation of Kerr black holes*, Phys. Rev. D **74**, 084028 (2006), arXiv:gr-qc/0608091, URL <http://arxiv.org/abs/gr-qc/0608091>.
19. C. D. Ott, H. Dimmelmeier, A. Marek, H.-T. Janka, I. Hawke, B. Zink, and E. Schnetter, *3d collapse of rotating stellar iron cores in general relativity including deleptonization and a nuclear equation of state*, Phys. Rev. Lett. **98**, 261101 (2007), arXiv:astro-ph/0609819, URL <http://arxiv.org/abs/gr-qc/0609819>.
20. B. Zink, N. Stergioulas, I. Hawke, C. D. Ott, E. Schnetter, and E. Müller, *Non-axisymmetric instability and fragmentation of general relativistic quasitoroidal stars*, Phys. Rev. D **76**, 024019 (2007), arXiv:astro-ph/0611601, URL <http://arxiv.org/abs/astro-ph/0611601>.
21. C. D. Ott, H. Dimmelmeier, A. Marek, H.-T. Janka, B. Zink, I. Hawke, and E. Schnetter, *Rotating collapse of stellar iron cores in general relativity*, Class. Quantum Grav. **24**, S139 (2007), arXiv:astro-ph/0612638, URL <http://arxiv.org/abs/astro-ph/0612638>.
22. E. Pazos, E. N. Dorband, A. Nagar, C. Palenzuela, E. Schnetter, and M. Tiglio, *How far away is far enough for extracting numerical waveforms, and how much do they depend on the extraction method?*, Class. Quantum Grav. **24**, S341 (2007), arXiv:gr-qc/0612149, URL <http://arxiv.org/abs/gr-qc/0612149>.

23. J. Thornburg, P. Diener, D. Pollney, L. Rezzolla, E. Schnetter, E. Seidel, and R. Takahashi, *Are moving punctures equivalent to moving black holes?*, *Class. Quantum Grav.* **24**, 3911 (2007), arXiv:gr-qc/0701038, URL <http://arxiv.org/abs/gr-qc/0701038>.
 24. M. Koppitz, D. Pollney, C. Reisswig, L. Rezzolla, J. Thornburg, P. Diener, and E. Schnetter, *Recoil velocities from equal-mass binary-black-hole mergers*, *Phys. Rev. Lett.* **99**, 041102 (2007), arXiv:gr-qc/0701163, URL <http://arxiv.org/abs/gr-qc/0701163>.
 25. D. Pollney, C. Reisswig, L. Rezzolla, B. Szilágyi, M. Ansorg, B. Deris, P. Diener, E. N. Dorband, M. Koppitz, A. Nagar, and E. Schnetter, *Recoil velocities from equal-mass binary black-hole mergers: a systematic investigation of spin-orbit aligned configurations*, *Phys. Rev. D* (accepted for publication) (2007), arXiv:0707.2559 [gr-qc], URL <http://arxiv.org/abs/0707.2559>.
 26. D. Stark, G. Allen, T. Goodale, T. Radke, and E. Schnetter, *An extensible timing infrastructure for adaptive large-scale applications*, in *Parallel Processing and Applied Mathematics (PPAM), 2007, Gdansk, Poland (in print)*, edited by R. Wyrzykowski (Springer, 2007), vol. 4967 of *Lecture Notes in Computer Science*, arXiv:0705.3015 [cs.PF], URL <http://arxiv.org/abs/0705.3015>.
 27. D. Brown, O. Sarbach, E. Schnetter, M. Tiglio, P. Diener, I. Hawke, and D. Pollney, *Excision without excision*, *Phys. Rev. D* **76**, 081503(R) (2007), arXiv:0707.3101 [gr-qc], URL <http://arxiv.org/abs/0707.3101>.
 28. L. Rezzolla, P. Diener, E. N. Dorband, D. Pollney, C. Reisswig, E. Schnetter, and J. Seiler, *The final spin from the coalescence of aligned-spin black-hole binaries*, *ApJ Letters* (accepted for publication) (2007), arXiv:0710.3345 [gr-qc], URL <http://arxiv.org/abs/0710.3345>.
 29. C. D. Ott, E. Schnetter, G. Allen, E. Seidel, J. Tao, and B. Zink, *A case study for petascale applications in astrophysics: Simulating Gamma-Ray Bursts*, in *Proceedings of the 15th ACM Mardi Gras conference: From lightweight mash-ups to lambda grids: Understanding the spectrum of distributed computing requirements, applications, tools, infrastructures, interoperability, and the incremental adoption of key capabilities* (ACM, Baton Rouge, Louisiana, 2008), no. 18 in *ACM International Conference Proceeding Series*, URL <http://doi.acm.org/10.1145/1341811.1341831>.
 30. M. C. Babiuc, S. Husa, I. Hinder, C. Lechner, E. Schnetter, B. Szilágyi, Y. Zlochower, N. Dorband, D. Pollney, and J. Winicour, *Implementation of standard testbeds for numerical relativity*, *Class. Quantum Grav.* (accepted for publication) (2007), arXiv:0709.3559 [gr-qc], URL <http://arxiv.org/abs/0709.3559>.
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Submitted to Refereed Journals

1. L. Rezzolla, E. N. Dorband, C. Reisswig, P. Diener, D. Pollney, E. Schnetter, and B. Szilágyi, *Spin diagrams for equal-mass black-hole binaries with aligned spins*, ApJ (accepted for publication) (2007), arXiv:0708.3999 [gr-qc], URL <http://arxiv.org/abs/0708.3999>.
 2. B. Zink, E. Schnetter, and M. Tiglio, *Multi-patch methods in general relativistic astrophysics – I. Hydrodynamical flows on fixed backgrounds*, Phys. Rev. D (accepted for publication) (2008), arXiv:0712.0353 [astro-ph], URL <http://arxiv.org/abs/0712.0353>.
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In Preparation

1. C. D. Ott and E. Schnetter, *The Cotton-York tensor as an analysis tool for the conformal flatness for numerical simulations*, in preparation (2008).
 2. C. D. Ott, H. Dimmelmeier, A. Marek, H.-T. Janka, , I. Hawke, and E. Schnetter, *3d general relativistic iron core collapse: postbounce evolution and rotational instabilities*, in preparation (2008).
 3. D. Brown, O. Sarbach, E. Schnetter, M. Tiglio, P. Diener, I. Hawke, and D. Pollney, *Excision without excision*, in preparation (2008).
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Book Chapters

1. E. Schnetter, C. D. Ott, G. Allen, P. Diener, T. Goodale, T. Radke, E. Seidel, and J. Shalf, *Cactus Framework: Black holes to gamma ray bursts*, in *Petascale Computing: Algorithms and Applications*, edited by D. A. Bader (Chapman & Hall/CRC Computational Science Series, 2007), chap. 24, arXiv:0707.1607 [cs.DC], URL <http://arxiv.org/abs/0707.1607>.
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Theses

1. E. Schnetter, *Untersuchungen zur Implementierung von Strahlungstransport im SPH-Formalismus* (engl.: *Investigations towards implementing radiative transport in the SPH formalism*), Diplomarbeit (in German), Fakultät für Physik, Universität Tübingen (1998).
 2. E. Schnetter, *Gauge fixing for the simulation of black hole spacetimes*, Ph.D. thesis, Universität Tübingen (2003), arXiv:gr-qc/0411002, URL <http://w210.ub.uni-tuebingen.de/dbt/volltexte/2003/819/>.
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Conference Proceedings and Technical Reports

1. S. Kunze, E. Schnetter, and R. Speith, *Applications of the Smoothed Particle Hydrodynamics method: The need for supercomputing*, in *Parallel Computational Fluid Dynamics, Towards Teraflops, Optimization and Novel Formulations. Proceedings of PARCFD99, the Parallel CFD'99 Conference*, edited by D. Keyes, A. Ecer, J. Periaux, N. Satofuka, and P. Fox (Elsevier, 2000), pp. 289–295.
2. S. Kunze, E. Schnetter, and R. Speith, *Development and astrophysical applications of a parallel smoothed particle hydrodynamics code with MPI*, in *High Performance Computing in Science and Engineering '99*, edited by E. Krause and W. Jäger (Springer, 2000), pp. 52–61.
3. R. Speith, E. Schnetter, S. Kunze, and H. Riffert, *Distributed implementation of SPH for simulations of accretion disks*, in *Molecular Dynamics on Parallel Computers*, edited by R. Esser, P. Grassberger, J. Grotendorst, and M. Lewerenz (World Scientific, 2000), pp. 276–285, proceedings of the Workshop at the John von Neumann-Institut for Computing (NIC), Research Centre Jülich, 8 - 10 February 1999.
4. E. Schnetter, S. Kunze, and R. Speith, *Fluid jet simulations using Smoothed Particle Hydrodynamics*, in *High Performance Computing in Science and Engineering 2000*, edited by E. Krause and W. Jäger (Springer, 2001), pp. 99–113.
5. E. Schnetter, *The Maya project: Simulations of binary black hole systems*, in *The Ninth Marcel Grossmann Meeting. On Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories. Proceedings of the MG9 Meeting* (World Scientific, 2001), vol. 3, pp. 1741–1742.
6. E. Schnetter, *A fast apparent horizon algorithm* (2002), arXiv:gr-qc/0206003, URL <http://arxiv.org/abs/gr-qc/0206003>.
7. F. Ott and E. Schnetter, *A modified SPH approach for fluids with large density differences* (2003), arXiv:physics/0303112, URL <http://arxiv.org/abs/physics/0303112>.
8. B. Zink, N. Stergioulas, I. Hawke, C. D. Ott, E. Schnetter, and E. Müller, *Rotational instabilities in supermassive stars: a new way to form supermassive black holes*, in *International Scientific Workshop on Cosmology and Gravitational Physics, Thessaloniki, December 15-16, 2005*, edited by N. K. Spyrou, N. Stergioulas, and C. Tsagas (ZITI, Thessaloniki, 2006), pp. 155–160.
9. G. Allen, E. Caraba, T. Goodale, Y. El Khamra, and E. Schnetter, *A scientific application benchmark using the Cactus Framework*, Tech. Rep., Center for Computation & Technology (2007), URL <http://www.cct.lsu.edu/>.
10. B. Zink, N. Stergioulas, I. Hawke, C. D. Ott, E. Schnetter, and E. Müller, *Fragmentation of general relativistic quasi-toroidal polytropes*, in *Proceedings of the 11th Marcel Grossmann Meeting (MG11) in Berlin, Germany, July 23-29, 2006* (2007 (submitted)), arXiv:0704.0431 [gr-qc], URL <http://arxiv.org/abs/0704.0431>.
11. J. Shalf, E. Schnetter, G. Allen, and E. Seidel, *Cactus as benchmarking platform*, Tech. Rep., Louisiana State University, Center for Computation & Technology (2007), URL <http://www.cct.lsu.edu/CCT-TR/CCT-TR-2006-3>.
12. E. Schnetter, G. Allen, T. Goodale, and M. Tyagi, *Alpaca: Cactus tools for application level performance and correctness analysis*, Tech. Rep., CCT Technical Report CCT-TR-2008-2 (2008), URL <http://www.cct.lsu.edu/CCT-TR/CCT-TR-2008-2>.

Recent Invited Presentations

1. E. Schnetter, *Modelling black holes and other exotic objects* (September 2006), invited talk given over the phone to HPC EXPO Online Conference & Exhibition, URL <http://advantagebusinessmedia.com/ims/hpc/>.
2. E. Schnetter, *The Cactus framework* (September 2006), invited talk given to MODEST collaboration in Pittsburgh, PA, URL <http://www.manybody.org/modest/>.
3. E. Schnetter, *Singularity replacement for black hole evolutions* (June 2007), invited talk given at the Instituto de Física y Matemáticas of the Universidad Michoacana de San Nicolás de Hidalgo in Morelia, Mexico, URL <http://www.ifm.umich.mx/>.
4. E. Schnetter, *Introduction to numerical relativity* (July 2007), lectures given at KISTI Numerical Relativity summer school in Pohang, South Korea, URL <http://www.ksc.re.kr/eng/>.
5. E. Schnetter, *Cactus concepts for distributed HPC applications* (January 2008), invited talk given at the Distributed Programming Abstractions Workshop of the 15th Mardi Gras Conference in Baton Rouge, LA, URL <http://www.mardigrasconference.org/>.
6. E. Schnetter, *Modelling black hole binary mergers* (February 2008), invited talk given at the Department of Physics and Astronomy in Oxford, MS, URL http://www.olemiss.edu/depts/physics_and_astronomy/.

Recent Contributed Presentations

1. E. Schnetter, *gnuplot* (February 2006), tutorial given to LSU HPC users in Baton Rouge, LA, URL <http://www.hpc.lsu.edu/>.
2. E. Schnetter, *Instant excision* (July 2006), talk given at NFNR conference in Potsdam, Germany.
3. E. Schnetter, *The Cactus framework* (November 2006), talk given at LSU booth at Supercomputing Conference in Tampa, FL, URL <http://sc06.supercomputing.org/>.
4. E. Schnetter, *Obstacles in numerical calculations* (November 2006), talk given at the workshop "From geometry to numerics" in Paris, France, URL <http://luth2.obspm.fr/IHP06/workshops/geomnum/>.
5. E. Schnetter, *Cactus/Carpet/CCATIE performance improvements* (March 2007), talk given to Numerical Relativity group at AEI in Potsdam, Germany, URL <http://numrel.aei.mpg.de/>.
6. E. Schnetter, *Multi-block systems in numerical relativity* (April 2007), talk given at APS April meeting in Jacksonville, FL, URL <http://meetings.aps.org/Meeting/APR07/>.
7. E. Schnetter, *Singularity replacement for black hole evolutions* (May 2007), talk given at East Coast Gravity Meeting in Ithaca, NY.
8. E. Schnetter, *An extensible timing infrastructure for adaptive large-scale applications* (September 2007), talk given at PPAM conference in Gdańsk, Poland, URL <http://www.ppam.pl/>.

9. E. Schnetter, *The BBH factory: Herding simulations* (October 2007), talk given to LSU relativity group in Baton Rouge, LA, URL <http://relativity.phys.lsu.edu/>.
10. E. Schnetter, *Modern Carpet* (October 2007), talk given to LSU relativity group in Baton Rouge, LA, URL <http://relativity.phys.lsu.edu/>.
11. E. Schnetter, *Cactus tools for petascale computing* (November 2007), talk given at LSU booth at Supercomputing Conference in Reno, NV, URL <http://sc07.supercomputing.org/>.
12. E. Schnetter, *The final spin of black hole binaries* (January 2008), talk given at the Center for Computational Relativity and Gravitation in Rochester, NY, URL <http://ccrg.rit.edu/>.
13. E. Schnetter, *A case study for petascale applications in astrophysics: Simulating gamma-ray bursts* (February 2008), talk given at the 15th Mardi Gras Conference in Baton Rouge, LA, URL <http://www.mardigrasconference.org/>.
14. E. Schnetter, *Cactus: A software framework for high performance computing* (March 2008), tutorial given at LSU High Performance Computing Workshop in Baton Rouge, LA, URL <http://www.hpc.lsu.edu/training/20080311/>.