Stanford

Tom Abel

Professor of Particle Physics and Astrophysics and of Physics

Curriculum Vitae available Online

Bio

BIO

What were the first objects that formed in the Universe, what is it made of, how does it work? Prof. Abel's group explores all of cosmic history using ab initio supercomputer calculations. He has shown from first principles that the very first luminous objects are very massive stars and has developed novel numerical algorithms using adaptive-mesh-refinement simulations that capture over 14 orders of magnitude in length and time scales. He has shown how the first stars galaxies form and affect everything that follows later. He has been pioneering novel numerical algorithms to study collisionless fluids such as dark matter as well as astrophysical and terrestrial plasmas. He has designed bespoke summary statistics to have interpretable, robust, efficient, summary statistics to describe spatial clustering based on fast nearest neighbor searches. His recent work is on creating digital twins of astronomical objects and the Universe as a whole in the context of the Center for Decoding the Universe. This Center leverages advances in machine learning and artificial intelligence to make sense of our Universe. He was the director of the Kavli Institute for Particle Astrophysics and Cosmology and Division Director at SLAC 2013-2018.

ACADEMIC APPOINTMENTS

- Professor, Particle Physics and Astrophysics
- Professor, Physics

ADMINISTRATIVE APPOINTMENTS

- Terman Fellow, Stanford University, (2007-2010)
- Director, Kavli Institute for Particle Astrophysics and Cosmology, Stanford/SLAC, (2013-2018)
- Visiting Professor, Heidelberg Institute of Theoretical Studies, (2010-2011)
- Visiting Professor, University of Heidelberg at Institute for Theoretical Astrophysics, (2010-2011)
- Founding Head, KIPAC Computational Physics department at SLAC, (2005-2005)
- Associate Professor Department of Physics, Kavli Institute for Particle Astrophysics and Cosmology, Stanford University, and SLAC, (2004- present)
- Associate Professor with tenure, Deptartment for Astronomy and Astrophysics, Pennsylvania State University, (2004-2004)
- Assistant Professor, Department for Astronomy and Astrophysics, Pennsylvania State University, (2002-2002)
- Wempe Lecturer, Astrophysical Institute, Potsdam, (2001-2001)
- Postdoctoral Researcher, Institute of Astronomy, Cambridge, (2001-2001)
- Postdoctoral Fellow, Harvard College Observatory, (1999-2001)
- Visitor, Max Planck Institute for Astrophysics, (1997-1999)
- Visiting Research Scholar, National Center for Supercomputing Applications, (1996-1999)

HONORS AND AWARDS

- Elected Fellow of the AAAS, American Association for the Advancement of Science (2014)
- Lagrange Prize, Institute Lagrange de Paris (2011)
- NSF Career Award, National Science Foundation (2003-2008)
- Gordon Bell Prize Finalist, Association for Computing Machinery (2001)
- Wempe Prize, Leibniz-Institut für Astrophysik Potsdam (2000)
- Scholarship, Deutscher Akademischer Austausch Dienst (1993-1994)
- Oskar Karl Forster Scholarship, Universität Regensburg (1993)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Associate Editor, Journal of Particle Astrophysics and Cosmology (JCAP) (2015 - present)
- Organizer, Collisionless Fluids, a workshop at the Institute Lagrange de Paris & IAP (2014 - 2014)
- Organizer, KIPAC@10, Big Questions in Particle Astrophysics and Cosmology, KIPAC, Stanford (2013 - 2013)
- Advisory Board Member, Hayden Planetarium Space Show (2012 - 2013)
- Organizer, Kavli Futures Symposium, "Growing High Performance Computing in a Green Environment" (2010 - 2010)
- Organizer, Kavli Futures Symposium, "Solving Real Problems with imagined Computers", SLAC (2009 - 2009)
- Advisory Board Member, Hayden Planetarium Space Show (2008 - 2009)
- Organizer, Scientific Challenges for Understanding the Quantum Universe and the Role of Computation at the Extreme Scale, SLAC (2008 - 2008)
- Co-Organizer (with Alex Heger & Brian O'Shea), First Stars III (2007 - 2007)
- Co-Organizer (with C. McKee, P. Padoan, & A. Goodman), Star formation over cosmic time, KITP Santa Barbara (2007 - 2007)
- Co-Organizer (with Yong Qian, Alex Heger & Tim Beers), The First Stars and Evolution of the Early Universe, INT Seattle (2006 - 2006)
- Chair, GRB physics before SWIFT, State College (2004 - 2004)
- Co-Organizer (with Andrew Hamilton, Martin Hachnelt & Andrea Ghez), Formation of Supermassive Black Holes (2004 - 2004)
- Chair, First Stars II, Pennsylvania State University (2003 - 2003)
- Co-Organizer (with Rosie Wyse), The Baryonic Universe, Aspen Winter workshop (2003 - 2003)
- Consultant, National Geographic Magazine (2003 - 2003)
- Member, Astro 2010 (2002 - present)
- Panel member, Department of Energy, Innovative & Novel Computational Impact on Theory and Experiment (INCITE) (2002 - present)
- Postdoc review panel member, National Science Foundation (2002 - present)
- Co-Organizer (with Achim Weiss & Vanessa Hill), First Stars (1999 - 1999)
- Referee, Nature (1998 - present)
- Referee, Monthly Notices of the Royal Astronomical Society (1998 - present)
- Referee, The Astrophysical Journal (1998 - present)
- Referee, New Astronomy (1998 - present)
- Referee, Science (1998 - present)

PROFESSIONAL EDUCATION

- Masters, University of Regensburg (1998)
- Ph.D, Ludwig Maximillians University Munich (1999)

LINKS

- Personal Website: tomabel.org

Teaching

COURSES

2026-27

- Computational Physics: PHYSICS 113 (Spr)

2024-25

- Computational Physics: PHYSICS 113 (Spr)
- Modern Astrophysics: PHYSICS 360 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Tara Dacunha, Minjie Lei, Marta Nowotka, Bernardita Ried Guachalla, Delon Shen, Mahlet Shiferaw

Postdoctoral Faculty Sponsor

Chris Byrohl

Doctoral Dissertation Advisor (AC)

Bryen Irving, Mati Mebratu

Doctoral (Program)

Tara Dacunha, Jack Dinsmore, Viraj Manwadkar, Bernardita Ried Guachalla, Haley Stueber

Postdoctoral Research Mentor

Eric Moseley

Publications

PUBLICATIONS

- **ENZO: AN ADAPTIVE MESH REFINEMENT CODE FOR ASTROPHYSICS** *ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES*
  Bryan, G. L., Norman, M. L., O'Shea, B. W., Abel, T., Wise, J. H., Turk, M. J., Reynolds, D. R., Collins, D. C., Wang, P., Skillman, S. W., Smith, B., Harkness, R. P., Bordner, et al
  2014; 211 (2)
- **The warm dark matter halo mass function below the cut-off scale** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Angulo, R. E., Hahn, O., Abel, T.
  2013; 434 (4): 3337-3347
- **A new approach to simulating collisionless dark matter fluids** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Hahn, O., Abel, T., Kaehler, R.
  2013; 434 (2): 1171-1191
- **Tracing the dark matter sheet in phase space** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Abel, T., Hahn, O., Kaehler, R.
  2012; 427 (1): 61-76
- **MAGNETIC FIELDS IN POPULATION III STAR FORMATION** *ASTROPHYSICAL JOURNAL*
  Turk, M. J., Oishi, J. S., Abel, T., Bryan, G. L.
  2012; 745 (2)

- **OUTFLOW FEEDBACK REGULATED MASSIVE STAR FORMATION IN PARSEC-SCALE CLUSTER-FORMING CLUMPS** *ASTROPHYSICAL JOURNAL*
  Wang, P., Li, Z., Abel, T., Nakamura, F.
  2010; 709 (1): 27-41
- **The Formation of Population III Binaries from Cosmological Initial Conditions** *SCIENCE*
  Turk, M. J., Abel, T., O'Shea, B.
  2009; 325 (5940): 601-605
- **MAGNETOHYDRODYNAMIC SIMULATIONS OF DISK GALAXY FORMATION: THE MAGNETIZATION OF THE COLD AND WARM MEDIUM** *ASTROPHYSICAL JOURNAL*
  Wang, P., Abel, T.
  2009; 696 (1): 96-109
- **GALAXY MERGERS WITH ADAPTIVE MESH REFINEMENT: STAR FORMATION AND HOT GAS OUTFLOW** *ASTROPHYSICAL JOURNAL LETTERS*
  Kim, J., Wise, J. H., Abel, T.
  2009; 694 (2): L123-L127
- **How very massive metal-free stars start cosmological reionization** *ASTROPHYSICAL JOURNAL*
  Wise, J. H., Abel, T.
  2008; 684 (1): 1-17
- **Resolving the formation of protogalaxies. II. Central gravitational collapse** *ASTROPHYSICAL JOURNAL*
  Wise, J. H., Turk, M. J., Abel, T.
  2008; 682 (2): 745-757
- **The formation of the first star in the universe** *SCIENCE*
  Abel, T., Bryan, G. L., Norman, M. L.
  2002; 295 (5552): 93-98
- **Photon-conserving radiative transfer around point sources in multidimensional numerical cosmology** *ASTROPHYSICAL JOURNAL*
  Abel, T., Norman, M. L., Madau, P.
  1999; 523 (1): 66-71
- **The SAGA Survey. V. Modeling Satellite Systems around Milky Way-Mass Galaxies with Updated U<sc>niverse</sc>M<sc>achine</sc>** *ASTROPHYSICAL JOURNAL*
  Wang, Y., Nadler, E. O., Mao, Y., Wechsler, R. H., Abel, T., Behroozi, P., Geha, M., Asali, Y., de los Reyes, M. A. C., Kado-Fong, E., Kallivayalil, N., Tollerud, E. J., Weiner, et al
  2024; 976 (1)
- **Small-scale signatures of primordial non-Gaussianity in k-nearest neighbour cumulative distribution functions** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Coulton, W. R., Abel, T., Banerjee, A.
  2024; 534 (3): 1621-1633
- **The AGORA High-resolution Galaxy Simulations Comparison Project. IV. Halo and Galaxy Mass Assembly in a Cosmological Zoom-in Simulation at z ≤ 2** *ASTROPHYSICAL JOURNAL*
  Roca-Fabrega, S., Kim, J., Primack, J. R., Jung, M., Genina, A., Hausammann, L., Kim, H., Lupi, A., Nagamine, K., Powell, J. W., Revaz, Y., Shimizu, I., Strawn, et al
  2024; 968 (2)
- **GUPPY I: a code for reducing the storage requirements of cosmological simulations** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Mansfield, P., Abel, T.
  2024; 531 (1): 1870-1883
- **Classical field approximation of ultralight dark matter: Quantum break times, corrections, and decoherence** *PHYSICAL REVIEW D*
  Eberhardt, A., Zamora, A., Kopp, M., Abel, T.
  2024; 109 (8)

- **The AGORA High-resolution Galaxy Simulations Comparison Project. V. Satellite Galaxy Populations in a Cosmological Zoom-in Simulation of a Milky Way-Mass Halo** *ASTROPHYSICAL JOURNAL*
  Jung, M., Roca-Fabrega, S., Kim, J., Genina, A., Hausammann, L., Kim, H., Lupi, A., Nagamine, K., Powell, J. W., Revaz, Y., Shimizu, I., Velazquez, H., Ceverino, et al
  2024; 964 (2)
- **The AGORA High-resolution Galaxy Simulations Comparison Project. VI. Similarities and Differences in the Circumgalactic Medium** *ASTROPHYSICAL JOURNAL*
  Strawn, C., Roca-Fabrega, S., Primack, J. R., Kim, J., Genina, A., Hausammann, L., Kim, H., Lupi, A., Nagamine, K., Powell, J. W., Revaz, Y., Shimizu, I., Velazquez, et al
  2024; 962 (1)
- **Robust cosmological inference from non-linear scales with k-th nearest neighbour statistics** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Yuan, S., Abel, T., Wechsler, R. H.
  2023; 527 (2): 1993-2009
- **Simulating the UniverseThe Universe in a Box: Simulations and the Quest to Code the Cosmos Andrew Pontzen Riverhead Books, 2023. 272 pp.** *Science (New York, N.Y.)*
  Abel, T.
  2023; 381 (6655): 276
- **2D k-th nearest neighbour statistics: a highly informative probe of galaxy clustering** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Yuan, S., Zamora, A., Abel, T.
  2023; 522 (3): 3935-3947
- **Computational fluid dynamics with the coupled discrete unified gas kinetic scheme (CDUGKS)** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Zamora, A., Slaughter, E., Abel, T.
  2023; 521 (2): 3186-3200
- **Tracer-field cross-correlations with k-nearest neighbour distributions** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Banerjee, A., Abel, T.
  2023; 519 (4): 4856-4868
- **Full forward model of galaxy clustering statistics with AbacusSummit light cones** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Yuan, S., Hadzhiyska, B., Abel, T.
  2023; 520 (4): 6283-6298
- **When quantum corrections alter the predictions of classical field theory for scalar field dark matter** *PHYSICAL REVIEW D*
  Eberhardt, A., Kopp, M., Abel, T.
  2022; 106 (10)
- **Detection of spatial clustering in the 1000 richest SDSS DR8 redMaPPer clusters with nearest neighbor distributions** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Wang, Y., Banerjee, A., Abel, T.
  2022; 514 (3): 3828-3843
- **Single classical field description of interacting scalar fields** *PHYSICAL REVIEW D*
  Eberhardt, A., Zamora, A., Kopp, M., Abel, T.
  2022; 105 (3)
- **Modelling nearest neighbour distributions of biased tracers using hybrid effective field theory** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Banerjee, A., Kokron, N., Abel, T.
  2022; 511 (2): 2765-2781
- **Self-similarity of k-nearest neighbour distributions in scale-free simulations** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*

Garrison, L. H., Abel, T., Eisenstein, D. J.
2022; 509 (2): 2281-2288

- **Field moment expansion method for interacting bosonic systems** *PHYSICAL REVIEW D*
  Eberhardt, A., Kopp, M., Zamora, A., Abel, T.
  2021; 104 (8)
- **The AGORA High-resolution Galaxy Simulations Comparison Project. III. Cosmological Zoom-in Simulation of a Milky Way-mass Halo** *ASTROPHYSICAL JOURNAL*
  Roca-Fabrega, S., Kim, J., Hausammann, L., Nagamine, K., Lupi, A., Powell, J. W., Shimizu, I., Ceverino, D., Primack, J. R., Quinn, T. R., Revaz, Y., Velazquez, H., Abel, et al
  2021; 917 (2)
- **Cosmological cross-correlations and nearest neighbour distributions** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Banerjee, A., Abel, T.
  2021; 504 (2): 2911-2923
- **First Star Formation in the Presence of Primordial Magnetic Fields** *ASTROPHYSICAL JOURNAL LETTERS*
  Koh, D., Abel, T., Jedamzik, K.
  2021; 909 (2)
- **Nearest neighbour distributions: New statistical measures for cosmological clustering** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Banerjee, A., Abel, T.
  2021; 500 (4): 5479–99
- **Investigating the use of field solvers for simulating classical systems** *PHYSICAL REVIEW D*
  Eberhardt, A., Banerjee, A., Kopp, M., Abel, T.
  2020; 101 (4)
- **High-redshift Galaxy Formation with Self-consistently Modeled Stars and Massive Black Holes: Stellar Feedback and Quasar Growth** *ASTROPHYSICAL JOURNAL*
  Kim, J., Wise, J. H., Abel, T., Jo, Y., Primack, J. R., Hopkins, P. F.
  2019; 887 (2)
- **BAM: bias assignment method to generate mock catalogues** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Balaguera-Antolinez, A., Kitaura, F., Pellejero-Ibanez, M., Zhao, C., Abel, T.
  2019; 483 (1): L58–L63
- **Reducing noise in cosmological N-body simulations with neutrinos** *JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS*
  Banerjee, A., Powell, D., Abel, T., Villaescusa-Navarro, F.
  2018
- **A new method for analyzing and visualizing plasma simulations using a phase-space tessellation** *PHYSICS OF PLASMAS*
  Totorica, S. R., Fiuza, F., Abel, T.
  2018; 25 (7)
- **Comparing fully general relativistic and Newtonian calculations of structure formation** *PHYSICAL REVIEW D*
  East, W. E., Wojtak, R., Abel, T.
  2018; 97 (4)
- **Tracing the cosmic web** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Libeskind, N. I., van de Weygaert, R., Cautun, M., Falck, B., Tempel, E., Abel, T., Alpaslan, M., Aragon-Calvo, M. A., Forero-Romero, J. E., Gonzalez, R., Gottloeber, S., Hahn, O., Hellwing, et al
  2018; 473 (1): 1195–1217
- **Ab Initio Simulations of a Supernova-driven Galactic Dynamo in an Isolated Disk Galaxy** *ASTROPHYSICAL JOURNAL*
  Butsky, I., Zrake, J., Kim, J., Yang, H., Abel, T.
  2017; 843 (2)
- **GRACKLE: a chemistry and cooling library for astrophysics** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*

Smith, B. D., Bryan, G. L., Glover, S. C., Goldbaum, N. J., Turk, M. J., Regan, J., Wise, J. H., Schive, H., Abel, T., Emerick, A., O'Shea, B. W., Anninos, P., Hummels, et al
2017; 466 (2): 2217-2234

- **Particle acceleration in laser-driven magnetic reconnection** *PHYSICS OF PLASMAS*
Totorica, S. R., Abel, T., Fiuza, F.
2017; 24 (4)

- **Doppler effect on indirect detection of dark matter using dark matter only simulations** *PHYSICAL REVIEW D*
Powell, D., Laha, R., Ng, K. C. Y., Abel, T.
2017; 95 (6)

- **THE AGORA HIGH-RESOLUTION GALAXY SIMULATIONS COMPARISON PROJECT. II. ISOLATED DISK TEST** *ASTROPHYSICAL JOURNAL*
Kim, J., Agertz, O., Teyssier, R., Butler, M. J., Ceverino, D., Choi, J., Feldmann, R., Keller, B. W., Lupi, A., Quinn, T., Revaz, Y., Wallace, S., Gnedin, et al
2016; 833 (2)

- **Voids in cosmological simulations over cosmic time** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Wojtak, R., Powell, D., Abel, T.
2016; 458 (4): 4431-4442

- **Nonthermal Electron Energization from Magnetic Reconnection in Laser-Driven Plasmas.** *Physical review letters*
Totorica, S. R., Abel, T., Fiuza, F.
2016; 116 (9): 095003-?

- **Simplex-in-cell technique for collisionless plasma simulations** *JOURNAL OF COMPUTATIONAL PHYSICS*
Kates-Harbeck, J., Totorica, S., Zrake, J., Abel, T.
2016; 304: 231-251

- **The properties of cosmic velocity fields** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Hahn, O., Angulo, R. E., Abel, T.
2015; 454 (4): 3920-3937

- **An exact general remeshing scheme applied to physically conservative voxelization** *JOURNAL OF COMPUTATIONAL PHYSICS*
Powell, D., Abel, T.
2015; 297: 340-356

- **COLD ACCRETION IN EARLY GALAXY FORMATION AND ITS Ly alpha SIGNATURES** *ASTROPHYSICAL JOURNAL*
Yajima, H., Li, Y., Zhu, Q., Abel, T.
2015; 801 (1)

- **Towards noiseless gravitational lensing simulations** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Angulo, R. E., Chen, R., Hilbert, S., Abel, T.
2014; 444 (3): 2925-2937

- **The birth of a galaxy - III. Propelling reionization with the faintest galaxies** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Wise, J. H., Demchenko, V. G., Halicek, M. T., Norman, M. L., Turk, M. J., Abel, T., Smith, B. D.
2014; 442 (3): 2560-2579

- **Escape of Ly alpha and continuum photons from star-forming galaxies** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
Yajima, H., Li, Y., Zhu, Q., Abel, T., Gronwall, C., Ciardullo, R.
2014; 440 (1): 776-786

- **REIONIZATION HISTORIES OF MILKY WAY MASS HALOS** *ASTROPHYSICAL JOURNAL*
Li, T. Y., Alvarez, M. A., Wechsler, R. H., Abel, T.
2014; 785 (2)

- **THE AGORA HIGH-RESOLUTION GALAXY SIMULATIONS COMPARISON PROJECT** *ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES*
Kim, J., Abel, T., Agertz, O., Bryan, G. L., Ceverino, D., Christensen, C., Conroy, C., Dekel, A., Gnedin, N. Y., Goldbaum, N. J., Guedes, J., Hahn, O., Hobbs, et al
2014; 210 (1)

- **DWARF GALAXIES WITH IONIZING RADIATION FEEDBACK. II. SPATIALLY RESOLVED STAR FORMATION RELATION** *ASTROPHYSICAL JOURNAL*
  Kim, J., Krumholz, M. R., Wise, J. H., Turk, M. J., Goldbaum, N. J., Abel, T.
  2013; 779 (1)
- **DWARF GALAXIES WITH IONIZING RADIATION FEEDBACK. I. ESCAPE OF IONIZING PHOTONS** *ASTROPHYSICAL JOURNAL*
  Kim, J., Krumholz, M. R., Wise, J. H., Turk, M. J., Goldbaum, N. J., Abel, T.
  2013; 775 (2)
- **Small-scale primordial magnetic fields and anisotropies in the cosmic microwave background radiation** *JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS*
  Jedamzik, K., Abel, T.
  2013
- **How closely do baryons follow dark matter on large scales?** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Angulo, R. E., Hahn, O., Abel, T.
  2013; 434 (2): 1756-1764
- **Single-Pass GPU-Raycasting for Structured Adaptive Mesh Refinement Data** *SPIE Conference on Visualization and Data Analysis (VDA)*
  Kaehler, R., Abel, T.
  SPIE-INT SOC OPTICAL ENGINEERING.2013
- **A Novel Approach to Visualizing Dark Matter Simulations** *IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS*
  Kaehler, R., Hahn, O., Abel, T.
  2012; 18 (12): 2078-2087
- **A Novel Approach to Visualizing Dark Matter Simulations.** *IEEE transactions on visualization and computer graphics*
  KAEHLER, R., Hahn, O., Abel, T.
  2012; 18 (12): 2078-2087
- **The birth of a galaxy - II. The role of radiation pressure** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Wise, J. H., Abel, T., Turk, M. J., Norman, M. L., Smith, B. D.
  2012; 427 (1): 311-326
- **WERE PROGENITORS OF LOCAL L* GALAXIES Ly alpha EMITTERS AT HIGH REDSHIFT?** *ASTROPHYSICAL JOURNAL*
  Yajima, H., Li, Y., Zhu, Q., Abel, T., Gronwall, C., Ciardullo, R.
  2012; 754 (2)
- **ART2: coupling Ly alpha line and multi-wavelength continuum radiative transfer** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Yajima, H., Li, Y., Zhu, Q., Abel, T.
  2012; 424 (2): 884-901
- **THE EFFECT OF ABSORPTION SYSTEMS ON COSMIC REIONIZATION** *ASTROPHYSICAL JOURNAL*
  Alvarez, M. A., Abel, T.
  2012; 747 (2)
- **THE BIRTH OF A GALAXY: PRIMORDIAL METAL ENRICHMENT AND STELLAR POPULATIONS** *ASTROPHYSICAL JOURNAL*
  Wise, J. H., Turk, M. J., Norman, M. L., Abel, T.
  2012; 745 (1)
- **Interactive Stereoscopic Visualization of Large-Scale Astrophysical Simulations** *Conference on Stereoscopic Displays and Applications XXIII (SD and A)/IS and T/SPIE Electronic Imaging - Science and Technology Symposium*
  Kaehler, R., Abel, T.
  SPIE-INT SOC OPTICAL ENGINEERING.2012
- **Turbulence and Small Scale Dynamo Action in Population III Star Formation** *Conference on FIRST STARS IV - From Hayashi to the Future*
  Oishi, J. S., Turk, M. J., Abel, T., Bryan, G.
  AMER INST PHYSICS.2012: 87–90

- **The Imprint of Pop III Stars on the First Galaxies** *Conference on FIRST STARS IV - From Hayashi to the Future*
  Wise, J. H., Abel, T., Turk, M. J., Norman, M. L., Smith, B. D.
  AMER INST PHYSICS.2012: 123–128
- **Cold accretion in early galaxy formation and its Lyman-alpha signatures** *The Astrophysical Journal*
  Yajima, H., Li, Y., Abel, T.
  2012
- **Investigation of Nitrogen and Carbon Co-implantation under Room Temperature and Cryo-condition** *19th International Conference on Ion Implantation Technology (IIT)*
  He, Y., Wu, B., Yu, G., Chen, Y., Liu, H., He, Y., Dai, H., Wu, J., Zhang, D. W., Lu, J., Xu, J., Guo, B.
  AMER INST PHYSICS.2012: 87–90
- **Magnetic Fields and Angular Momentum in Population III Star Formation** *Conference on FIRST STARS IV - From Hayashi to the Future*
  Turk, M. J., Oishi, J. S., Abel, T., Bryan, G. L.
  AMER INST PHYSICS.2012: 77–80
- **GALAXY FORMATION WITH SELF-CONSISTENTLY MODELED STARS AND MASSIVE BLACK HOLES. I. FEEDBACK-REGULATED STAR FORMATION AND BLACK HOLE GROWTH** *ASTROPHYSICAL JOURNAL*
  Kim, J., Wise, J. H., Alvarez, M. A., Abel, T.
  2011; 738 (1)
- **COMPARING NUMERICAL METHODS FOR ISOTHERMAL MAGNETIZED SUPERSONIC TURBULENCE** *ASTROPHYSICAL JOURNAL*
  Kritsuk, A. G., Nordlund, A., Collins, D., Padoan, P., Norman, M. L., Abel, T., Banerjee, R., Federrath, C., Flock, M., Lee, D., Li, P. S., Mueller, W., Teyssier, et al
  2011; 737 (1)
- **Multi-scale initial conditions for cosmological simulations** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Hahn, O., Abel, T.
  2011; 415 (3): 2101-2121
- **ENZO+MORAY: radiation hydrodynamics adaptive mesh refinement simulations with adaptive ray tracing** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Wise, J. H., Abel, T.
  2011; 414 (4): 3458-3491
- **rpSPH: a novel smoothed particle hydrodynamics algorithm** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Abel, T.
  2011; 413 (1): 271-285
- **The first stars, as seen by supercomputers** *PHYSICS TODAY*
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