CURRICULUM VITAE

FRANK DOUGLAS SWESTY

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Personal Data

Birth Date:	6 January 1964
Citizenship:	U.S.
Marital Status:	Unmarried

Degrees

State University of New York at Stony Brook, Stony Brook, NY (1987-1993)
Ph. D., Physics (1993); M.A., Physics (1990)
Pennsylvania State University, University Park, PA (1981-1985)
B.S. Honors, Physics and Astronomy, with Honors in Astronomy

Academic Appointments

2006-	Research Associate Professor, Department of Physics and Astronomy SUNY at Stony Brook
1998-2006	Research Assistant Professor, Department of Physics and Astronomy SUNY at Stony Brook
1996-1998	Visiting Research Assistant Professor of Astronomy and Research Scientist–National Center for Supercomputing Applications, University of Illinois
1995	Visiting Assistant Professor Department of Astronomy, University of Illinois
1993 - 1995	NSF Computational Science Postdoctoral Associateship National Center for Supercomputing Applications, University of Illinois
1993	Postdoctoral Research Associate, Dept. of Earth and Space Sciences State University of New York at Stony Brook

Professorial Level Teaching Experience

Spring 2001-	Taught numerous undegraduate and graduate courses in Dept. of Physics and Astronomy at SUNY Stony Brook
Fall 1995	Taught junior/senior level course on stellar astrophysics at University of Illinois Urbana–Champaign

Other Professional Experience

1984-85	Software Engineer, Intermetrics Inc. Warminster, Pa.

Academic Honors

NSF Computational Science Associateship, 1993-1995
Teas Scholar in Physics, 1984-85, Pennsylvania State University
Teas Scholar in Physics, 1983-84, Pennsylvania State University
elected to Phi Beta Kappa, 1984, Pennsylvania State University
University Scholar, 1983-85, Pennsylvania State University

Publications

1. "A Generalized Equation of State for Hot, Dense Matter" with James M. Lattimer, *Nucl. Phys.*, **A535**, (1991) 331

2. "Dense Matter and the Supernova Mechanism" with James M. Lattimer, in the *Proceedings of Hubert Reeves 60th Birthday Symposium*; (Paris, France, June, 1992)

3. "What Supernovae Can Tell Us About Nuclear Physics" with James M. Lattimer, in *Proceedings of the First Symposium on Nuclear Physics in the Universe*; (IOP: Bristol) 1993

4. "The QCD Phase Transition and Supernovae Core Collapse" with N. A. Gentile, G. J. Mathews, M. B. Aufderheide, and G. M. Fuller, *Astrophysical Journal*, **414** (1993), 701

5. "An Equation of State of Hot, Dense Matter" with James M. Lattimer, to be published in *Computational Astrophysics*; *Volume II* (Springer Verlag) (1995)

6. "The Role of the Equation of State in the "Prompt" Phase of Type II Supernovae" with James M. Lattimer and Eric S. Myra, *Astrophysical Journal* **425**, (1994), 195

7. "Implicit General Relativistic Hydrodynamic Methods for Modeling the Late–Time Explosion Mechanism in Core Collapse Supernovae" *Astrophysical Journal*, **445**, (1995), 811

8. "Thermodynamically Consistent Interpolation for Equation of State Tables" *Journal of Computational Physics*, **127**, (1996), 118

9. "Parallel Computing Issues in Simulating Coalescing Neutron Stars" with Paul Saylor,¿ in *High Performance Computing 1997: Grand Challenges in Computer Simulation*, Ed. A. Tentner, (SCS: San Diego), 1997

10. "Scalable, Hydrodynamic and Radiation-Hydrodynamic Studies of Neutron Star Merg-¿ ers and Supernovae Explosions" with Paul Saylor, Dennis Smolarski, and Ed Wang, in *Proceedings of Supercomputing 97*, (IEEE: San Jose)

11. "On the Use of the Gray Approximation in 2-D Neutrino Transport Models of Core Collapse Supernovae", in *Stellar Evolution, Stellar Explosions and Galactic Chemical Evolution*, Ed. A. Mezzacappa, 1998 (IOP: Bristol) p. 539

12. "Numerical Models of Newtonian and Post-Newtonian Binary Neutron Star Mergers" , with A. Calder and E. Wang, in *Stellar Evolution, Stellar Explosions and Galactic Chemical Evolution*, Ed. A. Mezzacappa, 1998 (IOP: Bristol) p. 723

13. "Numerical Methods for Modeling Binary Neutron Star Systems" in *Stellar Evolution, Stellar Explosions and Galactic Chemical Evolution*, with A. Calder, and E. Wang, Ed. A. Mezzacappa, 1998 (IOP:Bristol) p. 719

14. "Relativistic Astrophysical Hydrodynamics on Parallel Platforms" , in *High Performance Computing 1999: Grand Challenges in Computer Simulation*, with P. Saylor, Ed. A. Tentner, 1999 (SCS: San Diego)

15. "The Accuracy, Consistency, and Speed Of An Electron-Positron Equation Of State Based On Table Interpolation Of The Helmholtz Free Energy", with F. Timmes, *Astrophys. J. Suppl. Ser.*, **126**, pg. 501 (2000)

16. "Numerical Models of Binary Neutron Star System Mergers. I.: Numerical Methods and Equilibrium Data for Newtonian Models", with A. Calder and E. Wang, *Astrophys. J.*, **541**, pg. 937 (2000)

17. "Coalescing Binary Neutron Star Systems", with A. Calder and E. Wang, in *Relativistic Astrophysics: 20th Texas Symposium. AIP Conference Proceedings*, **586**, 796 (2001)

18. "A Semi-analytic Model for the Radiation Reaction Luminosity for Post-Newtonian Binary Neutron Star Mergers", with A. Calder, in *Relativistic Astrophysics: 20th Texas Symposium. AIP Conference Proceedings*, **586**, 808 (2001)

19. "A Comparison of Algorithms for the Efficient Solution of the Linear Systems Arising from Multigroup Flux-limited Diffusion Problems" , with P. Saylor and D. Smolarski, *Astrophys. J. Suppl. Ser.* **153** 369 (2004)

20. "On the performance of SPAI and ADI-like preconditioners for core collapse supernova simulations in one spatial dimension", with D. Smolarski, R. Balakrishnan, E. D'Azevedo, J. Fettig, B. Messer, A. Mezzacappa, F. Saied, and P. Saylor, *Computer Phys. Comm.* **175** 330 (2006)

21. "A Newton-Krylov solver for implicit solution of hydrodynamics in core collapse supernovae", with D. Reynolds and C. Woodward, *J. of Phys. Conf. Ser.* **125** 2085 (2009)

22. "A Numerical Algorithm for Modeling Neutrino-Radiation Hydrodynamics in Two Spatial Dimensions", with E. Myra, *Astrophys. J. Suppl. Ser.* **181** 1 (2009)

23. "Answering Fundemental Questions About the Universe", with E. Myra, in *Data Intensive Science*, Chapman and Hall/CRC (2013)

24. "White Dwarf Mergers on Adaptive Meshes I. Methodology and Code Verification", with M. Katz, M. Zingale, A. Calder, A. Almgren, and W. Zhang, *Astrophys. J.* (2016) **819**, 94

25. "Quantification of Incertitude in Black Box Simulation Codes", with A. C. Calder, M. M. Hofman, D. E. Willcox, M. P. Katz, and S. Ferson *J. Phys. Conf. Ser.* (2018) **1031**, 012016

26. "Performance of an Astrophysical Radiation Hydrodynamics Code under Scalable Vector Extension Optimization", with A. Calder, D. Smolarski, *IEEE International Conference on Cluster Computing (CLUSTER)* (2022)

Thesis

"The Physics Of Core Collapse Supernovae", March 1993

Summary of Research Interests

Supernovae – Problems involving the explosion mechanism and the possible signatures of interesting physics, such as gravitational radiation, the quark-hadron phase transition, and meson condensation, in supernovae and cooling proto-neutron stars.

Compact Object Mergers – Numerical modeling of NS-NS and NS-BH mergers. Emission of gravitational radiation during in-spiral of binary compact object systems. Prediction of LIGO signals. Also, the physics of the merger such as equation of state effects, r–process nucleosynthesis, and the possibility of gamma ray bursts.

Relativistic Radiation Hydrodynamic Simulations – Large scale hydrodynamic simulations of astrophysical phenomena which may involve the modeling of photon and neutrino transport. The development of algorithms for 3-d general relativistic hydrodynamics and spacetime evolution. Also the implementation of radiation hydrodynamic algorithms on massively parallel, scalable architectures.

The Equation of State of Hot, Dense Matter – The calculation of the EOS by various techniques. The measurement and constraint of nuclear force parameters by laboratory experiment, particularly the incompressibility, symmetry energy coefficients, and the level density. Attempts to constrain the EOS by astrophysical measurement.

Neutron Stars – Questions regarding birth, structure and thermal evolution of neutron stars. Origin of pulsar velocity distribtions. Also questions involving pulsar behavior, i.e. "glitching", and the relationship to nucleon super-fluidity.

Nucleosynthesis – Primordial and stellar (i.e. novae and supernovae) nucleosynthesis and the relationship to galactic chemical evolution. This includes constraints on nucleosynthetic models imposed by observations of isotopic abundances.

Many Body Problem – Issues involving the equation of state and transport phenomena, both in dense matter and condensed matter systems. Also, the relationship between the EOS and relativistic heavy-ion physics.

Convection in Massive Stellar Evolution – Issues involving the role of convective burning in the late stages of evolution of massive stars. This includes questions involving nucleosynthetic yields as well as the structure of pre-supernova progenitors.