Giovanni Lapenta, Professor of Mathematics of Space Weather, Katholieke Universiteit Leuven

Professional Preparation	Appointments	Awards & Recognitions
• M.S. (1990) in Nuclear Engineering & Ph.D. (1993) in Plasma Physics, Politecnico di Torino, Italy • Research Associate, Research Centre of the Italian Telecom, 1990-1991. • Visiting Scientist at the Massachusetts Institute of Technology, 1992. • Visiting Scientist at Los Alamos National Laboratory from 1992 to 1994. • Director's Postdoctoral Fellow at Los Alamos National Laboratory from 1994 to 1996.	• Professor of the Mathematics of Space Weather, Katholieke Universiteit Leuven (Belgium), 2008—present • Research Consultant, University of Colorado, Boulder, 2008–present • Technical Staff Member at LANL, 1996-2007. • Tenured Research Professor of Plasma Physics at Politecnico di Torino, 1996-2001.	• Editor, Non-linear Processes in Geophysics • Recipient of the Research and Development 100 (R&D100) prize in 2005 for his work on high performance computing • Coordinator, Soteria EC-project (www.soteria-space.eu) • Steering Board member, INTEL ExascienceLab (www.exascience.com) • Member of the Italian National Group for Mathematical Physics • Panel member, NSF and NSF-DOE

Research Interests   Lapenta's research work focuses on computational physics and on the theory and simulation of problems in plasma physics.

In computational physics, Lapenta's work has considered finite differences, finite elements and particle in cell methods, developing and analyzing new numerical techniques and applying numerical methods to the study of specific problems. Furthermore, Lapenta has worked on Krylov methods to solve linear systems, on non-linear Newton-Krylov methods and on adaptive meshes.

In plasma physics, Lapenta's work has considered problems relevant to fusion devices, industrial plasma processing devices, complex (dusty) plasmas, astrophysics and space physics. Lapenta has published a number of papers on the kinetic study of linear waves and instabilities and on nonlinear processes in space and laboratory plasmas, focusing particularly on the process of magnetic reconnection.

Lapenta's work has also considered problems in nuclear engineering and neutron transport for application to fusion and fission reactors. Lapenta has worked in statistical physics (non extensive or Tsallis distributions), in optical physics (optical waveguides and soliton dynamics) and in material science and engineering (simulation of soft matter and nanomaterials).

Lapenta has been involved in large research efforts in USA and in Europe, as principal investigator and as co-investigator. He is currently the Coordinator of the European Space Weather project SOTERIA (www.soteria-space.eu). Other examples of his scientific leadership are numerous LANL plasma pjhysics projects (Laboratory Directed Research and Development, LDRD); the NASA Sun Earth Connection Theory program; the Italian Institute for the Physics of Matter (INFM) project on non-neutral plasmas; the ESA-NASA project on complex (dusty) plasma experiments onboard the International Space Station Alpha; European projects on subcritical nuclear reactors for the transmutation of nuclear wastes.

Current Projects

- Theory and simulation of plasma physics problems in laboratory, space and in astrophysics.

- Development of methods and algorithms for plasma and astrophysics simulation.

- Coordination of the European Commission funded research project SOTERIA on Space Weather (www.soteria-space.eu).

- Study of material science processes involving plasma and fluid dynamics, including the study of dusty plasmas.

Publications
Author or co-author of over 120 refereed publications, and more than 350 scientific presentations.

Most Relevant Recent Publications
- S. Markidis, G. Lapenta, Multi-scale Simulations of Plasma with iPIC3D, *Mathematics and Computers in Simulation, 80*, 1509-1519, 2010.
- T. Intrator, X. Sun, G. Lapenta, L. Dorf, I. Furno, Experimental onset threshold and magnetic pressure pileup for 3D Sweet-Parker reconnection, *Nature Physics*, *5*, 521 - 526, DOI: 10.1038/NPHYS1300, 2009.
- Self-Feeding Turbulent Magnetic Reconnection on Macroscopic Scales, *Physical Review Letters, 100*, 235001, 2008.
- G. Lapenta, S. Markidis, A. Marocchino, G. Kaniadakis, Relaxation of Relativistic Plasmas Under the Effect of Wave-Particle Interactions, *Astrophysical Journal, 666*, 949-954, 2007.
- G. Lapenta, J.U. Brackbill, P. Ricci, Kinetic Approach to microscopic-macroscopic coupling in space and laboratory plasmas, *Physics of Plasmas, 13*, 055904, 2006.

Most Significant Relevant Publications
- G. Lapenta, D.A. Knoll, Effect of a Converging Flow at the Streamer Cusp on the Genesis of the Slow Solar Wind, *Astrophysical Journal, 624*, 1049, 2005.
- P. Ricci, J.U. Brackbill, W.S. Daughton, G. Lapenta, Collisionless magnetic reconnection in the presence of a guide field, *Physics of Plasmas, 11*, 4102-4114, 2004.
- G. Lapenta, J.U. Brackbill, Nonlinear Evolution of the Lower Hybrid Drift Instability: Current Sheet Thinning and Kinking, *Physics of Plasmas, 9*, 1544-1554, 2002.
- G. Lapenta, J.U. Brackbill, A Kinetic Theory for the Drift-Kink Instability, *Journal of Geophysical Research, 102*, 27099-27108, 1997.
- G. Lapenta, J.U. Brackbill, Dynamic and Selective Control of the Number of Particles in Kinetic Plasma Simulations , *Journal of Computational Physics, 115*, 213-227, 1994.

Conflicts of Interest
Graduate and Postdoc Advisors: Coppa, Ravetto (Politecnico di Torino, Italy)
Former PhD Students and Post Docs: Delzanno (LANL), Ricci (EPFL, Switzerland), Wan (University of Colorado).
Collaborators: several groups at Los Alamos National LAboratory and at University of Colorado