LUIGI VERGORI

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Dipartimento di Ingegneria,
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Research Topics

Stability of harmonic maps;
Linear and nonlinear stability in implicit theories of fluid dynamics;
Mathematical modelling of non-Newtonian fluids
Piezo-viscous fluids;
Mechanics of nematic shells;
Nonlinear elasticity;
Nonlinear waves.

Academic Qualifications

2014-2016: Postgraduate Certificate, University of Glasgow, Learning & Teaching Centre, Glasgow, United Kingdom.

2005-08: PhD in Mathematics, Università del Salento, Lecce, Italy.
Thesis: *Linear and Nonlinear Stability in non-standard Theories of Fluid Dynamics*;
Advisor: Professor Giuseppe Saccomandi.

1996-2003: BSc & MSc in Mathematics, Università degli Studi di Lecce, Italy (awarded cum laude).

Teaching and Research Experience

November 7^{th} 2016– to date: Associate Professor in Mathematics at the Università di Perugia.

September 9^{th} 2013– to November 6^{th} 2016: Lecturer B (grade 8) in Mathematics at the University of Glasgow.

March 2012–September 8^{th} 2013: Marie Curie Fellow of the Istituto Nazionale di Alta Matematica (INdAM) based at the National University of Ireland Galway.

September 2012–December 2012: Teaching Assistant for the course 'Nonlinear Elasticity', NUIGalway.

November 2008–October 2011: Postdoctoral Fellow, Department of Mathematics, Università del Salento, Lecce, Italy.

September 2008–March 2011: Adjunct Professor of Rational Mechanics, Department of Industrial Engineering, Università del Salento, Lecce, Italy.

Distinctions

- 2018 annual prize for the best publication of the young researchers of the University of Perugia.
- 2013 AIMETA (Italian Association of Theoretical and Applied Mechanics) Junior prize for the innovative contributions in the mathematical modelling of nematic liquid crystals coating curved surfaces.

Fundings

2023-26: Mathematical modelling for a sustainable circular economy in ecosystems (PI of the research unit of the University of Perugia); Italian Ministry of University and Research.

2023-25: The Mathematics and Mechanics of Nonlinear Wave Propagationin Solids; Italian Ministry of University and Research.

2019-22: Mathematics of active materials: from mechanobiology to smart devices; Italian Ministry of University and Research.

2017-18: Spherical nematic shells (PI); INdAM young researchers' project.

2014-15: Bending and unbending of a hyperelastic material (PI); Carnegie Trust (Glasgow 2014).

2012-14: INdAM outgoing fellowship in mathematics and its applications for experienced researchers

2010-11: Postdoctoral Fellowship competitive funding, Università del Salento, Lecce, Italy.

2008-11: Adjunct Professorship competitive funding, Università del Salento, Lecce, Italy.

2008-10: Postdoctoral Fellowship competitive funding, Università del Salento, Lecce, Italy.

2005-08: PhD competitive funding, Università del Salento, Lecce, Italy.

Publications

1. A. AMENDOLA, J. de CASTRO MOTTA, L. VERGORI: Wave propagation in compressible hyperelastic solids in the presence of powerless internal forces. International Journal of Engineering Science **214** (2025), 104294.

2. G. SACCOMANDI, L. VERGORI: The only solitary wave that matters: the sech^2-type. Riv. Mat. Univ. Parma, Vol. 15 (2024), 213-222.

3. G. SACCOMANDI, L. VERGORI: Solitary waves in slightly dispersive quasi-incompressible hyperelastic materials. International Journal of Solids and Structures **298** (2024), 112861.

4. A. FARINA, L. FUSI, L. VERGORI, E.M. ZANETTI: Viscoplastic flows in channels with small aspect ratio: Bingham versus regularised models. International Journal of Engineering Science **199** (2024), 104074.

5. A. AMENDOLA, J. de CASTRO MOTTA, G. SACCOMANDI, L. VERGORI: A constitutive model for transversely isotropic dispersive materials. Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences **480** (2024), 20230374.

6. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: Two classes of exact solutions in the linear elastodynamics of transversely isotropic solids. Ricerche di Matematica **73** (2024), 275-291.

7. G. SACCOMANDI, L. VERGORI: Waves in isotropic dispersive elastic solids. Wave motion **116** (2023), 103066.

8. L. FUSI, L. VERGORI: The Rayleigh-Bénard problem for a fluid with pressure- and temperature-dependent material properties. Zeitschrift für angewandte Mathematik und Physik **74**(1) (2023), 8.

9. G. SACCOMANDI, L. VERGORI, E.M. ZANETTI: Linear, weakly nonlinear and fully nonlinear models for soft tissues: Which ones provide the most reliable estimations of the stiffness? Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences **380** (2022), 20210321.

10. L. FUSI, A. FARINA, K.R. RAJAGOPAL, L. VERGORI: Channel flows of shear-thinning fluids that mimic the mechanical response of a Bingham fluid. International Journal of Non-Linear Mechanics **138** (2022), 103847.

11. L. FUSI, K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: Flow past a porous plate of non-Newtonian fluids with implicit shear stress shear rate relationships. European Journal of Mechanics, B/Fluids **92** (2022), 166–173.

12. G. NAPOLI, O. PYLYPOVSKYI, D.D SHEKA, L. VERGORI: Nematic shells: New insights in topology- and curvature-induced effects. Soft Matter **17** (2021), 10322-10333.

13. G. NAPOLI, L. VERGORI: Cooling a spherical nematic shell. Physical Review E **104** (2021), L022701.

14. G. SACCOMANDI, L. VERGORI: Some Remarks on the Weakly Nonlinear Theory of Isotropic Elasticity. Journal of Elasticity **147** (2021), 33–58.

15. G. SACCOMANDI, E. SPERANZINI, L. VERGORI: Shear Deformations for Weakly-Nonlinear Elastic Materials. Lecture Notes of TICMI **21** (2020), 107–119.

16. G. SACCOMANDI, L. VERGORI: On universal relations in continuum mechanics: A discussion centred on shearing motions. Applications in Engineering Science **4** (2020), 100020.

17. C. ROGERS, G. SACCOMANDI, L. VERGORI: Helmholtz-type solitary wave solutions in nonlinear elastodynamics. Ricerche di Matematica **69** (2020), pp. 327–341.

18. E. PUCCI, G.SACCOMANDI, L. VERGORI: Linearly polarized waves of finite amplitude in pre-strained elastic materials. Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences **475** (2019), 20180891.

19. G. SACCOMANDI, L. VERGORI: Generalised Mooney-Rivlin models for brain tissue: A theoretical perspective. To appear in International Journal of Non-Linear Mechanics **109** (2019), 9–14.

20. G. SACCOMANDI, L. VERGORI: Old Problems Revisited from New Perspectives in Implicit Theories of Fluids. In: Angiolo Farina, Andro Mikelić, Giuseppe Saccomandi, Adélia Sequeira, Eleuterio F. Toro. Non-Newtonian Fluid Mechanics and Complex Flows. Lecture Notes in Mathematics 2212 (2018), Springer, Cham, 45–90.

21. C. ROGERS, G. SACCOMANDI, L. VERGORI: Cnoidal and gausson phenomena in nonlinear elastodynamics. Acta Mechanica (2018), 1-12.

22. G. NAPOLI, L. VERGORI: Influence of the extrinsic curvature on two-dimensional nematic films. Physical Review E, **97** (2018), 052705.

23. T. SIGAEVA, R. MANGAN, L. VERGORI, M. DESTRADE, L. SUDAK: Wrinkles and creases in the bending, unbending and eversion of soft sectors. Proceedings of the Royal Society of London Series A: Mathematical, Physical and Engineering Sciences, **474** (2018), 20170827.

24. D. MACTAGGART, L. VERGORI, J. QUINN: Braginskii magnetohydrodynamics for arbitrary magnetic topologies: Coronal applications. Journal of Fluid Mechanics, **826** (2017), 615–635.

25. G. SACCOMANDI, L. VERGORI: Large time approximation for shearing motions. SIAM Journal on Applied Mathematics, 76(5) (2016), 1964–1983.

26. G. NAPOLI, L. VERGORI: Hydrodynamic theory for nematic shells: The interplay among curvature, flow and alignment. Physical Review E, 94 (2016), 020701(R).

27. A.A. HILL, K.R. RAJAGOPAL, L. VERGORI: On the stability and uniqueness of the flow of a fluid through a porous medium. Zeitschrift für Angewandte Mathematik und Physik **67**(3) (2016), 1–12.

28. C. ROGERS, G. SACCOMANDI, L. VERGORI Ermakov-modulated nonlinear Schrödinger models. integrable reduction. Journal of Nonlinear Mathematical Physics, 23(1) (2016), pp. 108–126.

29. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *On the approximation of isochoric motions of fluids under different flow conditions.* Proceedings of the Royal Society of London Series A: Mathematical, Physical and Engineering Sciences, 471(2180) (2015), 20150159.

30. C. ROGERS, G. SACCOMANDI, L. VERGORI: *Nonlinear elastodynamics of materials with strong ellipticity condition: Carroll-type solutions.* Wave Motion **56** (2015), 147–164.

31. C. ROGERS, G. SACCOMANDI, L. VERGORI: *Carroll-type deformations in nonlinear elastodynamics.* Journal of Physics A: Mathematical and Theoretical, **47** (2014), 205204.

32. M. DESTRADE, R.W. OGDEN, I. SGURA, L. VERGORI. *Straightening: existence, uniqueness and stability.* Proceedings of the Royal Society of London Series A: Mathematical, Physical and Engineering Sciences, **470** (2014), 20130709.

33. M. DESTRADE, R.W. OGDEN, I. SGURA, L. VERGORI. Straightening wrinkles. Journal of the Mechanics and Physics of Solids **65** (2014), 1–11.

34. G. NAPOLI, L. VERGORI: *Effective free energies for cholesteric shells.* Soft Matter **9** (2013), 8378–8387.

35. L. VERGORI, M. DESTRADE, P. McGARRY, R.W. OGDEN: *On anisotropic elasticity and questions concerning its Finite Element implementation.* Computational Mechanics **52** (2013), 1185–1197.

36. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *Unsteady flows of fluids with pressure dependent viscosity.* Journal of Mathematical Analysis and Applications **404** (2013), 362–372.

37. G. NAPOLI, L. VERGORI: *Curvature-induced ordering in cylindrical nematic shells.* International Journal of Nonlinear Mechanics **49** (2013), 66–71.

38. G. NAPOLI, L. VERGORI: *Extrinsic Curvature Effects on Nematic Shells.* Physical Review Letters **108** (2012), 207803.

39. G. NAPOLI, L. VERGORI: *Surface free energies for nematic shells.* Physical Review E **85** (2012), 061701.

40. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *Flow of fluids with pressure and shear dependent viscosity down an inclined plane.* Journal of Fluid Mechanics **706** (2012), 173–189.

41. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *Stability of Rayleigh-Bénard convection in a porous medium.* Zeitschrift für angewandte Mathematik und Physik **62** (2011), 149–160.

42. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *Couette flow with frictional heating in a fluid with temperature and pressure dependent viscosity.* International Journal of Heat and Mass Transfer **54** (2011), 783–789.

43. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *Linear stability of Hagen-Poiseuille flow in a chemically reacting fluid.* Computer & Mathematics with Applications **61** (2011), 460–469.

44. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *A systematic approximation for the equations governing convection-diffusion in a porous medium.* Nonlinear Analysis: Real World Applications **11** (2010), 2366–2375.

45. G. SACCOMANDI, L. VERGORI: *Piezo-viscous flows over an inclined surface.* Quarterly Journal of Applied Mathematics **68** (2010), 747–763.

46. L. VERGORI: *Flows at small Reynolds and Froude numbers.* International Journal of Engineering Science **11** (2010), 1659–1670.

47. L. VERGORI: *Couette and Poiseuille flows in bitumen.* Proceedings of the 15th Conference on Waves and Stability in Continuous Media, World Scientific, Singapore (2010) ISBN 981-4317-41-1, 359–364.

48. G. NAPOLI, L. VERGORI: *Equilibrium of nematic vesicles.* Journal of Physics A: Mathematical and Theoretical, **43** (2010), 445207.
G. NAPOLI, L. VERGORI: Corrigendum: Equilibrium of nematic vesicles (2010 J. Phys. A: Math. Theor. 43 445207). Journal of Physics A: Mathematical and Theoretical, **51** (2018), 359501.

49. S. RIONERO, L. VERGORI: *Long-time behaviour of fluid motions in porous media according to Brinkman model.* Acta Mechanica **210** (2010), 221–240.

50. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *On the Oberbeck-Boussinesq approximation for fluids with pressure-dependent viscosities.* Nonlinear Analysis: Real World Applications **10** (2009), 1139–1150.

51. K.R. RAJAGOPAL, G. SACCOMANDI, L. VERGORI: *Stability analysis of the Rayleigh-Bénard convection for a fluid with temperature and pressure dependent viscosity.* Zeitschrift für angewandte Mathematik und Physik **60** (2009), 739–755.

52. L. VERGORI: *Spectral geometry for the Jacobi operator of the identity map.* Note di Matematica, vol. **28**, n. 1 (2008), 29-42.

53. D. PERRONE, L. VERGORI: *Stability of contact metric manifolds and unit vector fields of minimum energy.* Bull. Austral. Math. Soc. Vol. **76** (2006), 269-283.

54. S. RIONERO, L. VERGORI: *A note on the nonlinear stability of laminar MHD flows in a porous medium in the presence of Brinkman law.* Rend. Acc. Sc. fis. mat. Napoli, Vol. LXXIII (2006), 387-402.

Expertise

Journal reviewer: International Journal of Engineering Science; International Journal of Non-Linear Mechanics; Chemical Engineering & Technology; The Quarterly Journal of Mechanics and Applied Mathematics; International Journal of Engineering, Science and Technology; Mathematics and Computers in Simulation; Theoretical and Computational Fluid Dynamics; Zeitschrift für Angewandte Mathematik und Physik; Acta Mechanica; Theoretical & Applied Mechanical Letters; Proceedings of the Royal Society of London Series A: Mathematical, Physical and Engineering Sciences; Physical Review E; Journal of Rheology; European Journal of Mechanics/B Fluids; Journal of the Brazilian Society of Mechanical Sciences and Engineering; Journal of Elasticity; Soft Matter.

Project proposal reviewer: Post-doc research project proposal for the Czech Science Foundation, Czech Republic.

Conference as organiser:

- Nonlinear Elasticity and All That, November 19-22 2024, Bari, Italy.
- Giornate Signorini 2023, December 14-15 2023, Firenze, Italy.
- Giornate Signorini 2022, November 4-5 2022, Perugia, Italy.

- WASCOM 2011, 16th International Conference on Waves and Stability in Continuous Media, June 12 - 18 2011, Brindisi, Italy.

Advanced School as co-organiser and lecturer: Advanced School on Theories and Applications of Liquid Crystals, September 3rd-7th 2018, Naples.