# Dimitris Sfyris

Principal Researcher (Grade B) Institute of Applied and Computational Mathematics Foundation for Research and Technology 100, N. Plastira str 70013, Vassilika Vouton Heraklion, Crete, Greece Bulding B ETEP, office 320

Email: dsfyris@iacm.forth.net Phone: 0030 2810 391423

### Personal

Born on October 17, 1980.

Married, one son.

## Education

Ph.D. Mechanics/Mathematics, Aristotle University of Thessaloniki, Greece, June 2007.

M.Sc. Mechanics, National Technical University of Athens, Greece, September 2003.

B.Sc. Mathematics, University of Ioannina, Greece, September 2002.

## Awards

Academician P.S. Theocharis award on Mechanics from the Academy of Athens (awarded 22.12.2015).

## **Research Interests**

Nonlinear Continuum Mechanics • Nonlinear Elasticity • Nonlinear Continuum Theory of Dislocations • Nonlinear Elastoplasticity • Material Mechanics • Applied Mathematics • Graphene • Thin Films • Electro-magneto-elasticity

## Academic Positions

Principal Researcher (Researcher B) Institute of Applied and Computational Mathematics Foundation for Research and Technology Heraklion, Crete 01/07/2019-today

Post-doctoral Researcher National technical University of Athens School of Chemical Engineering Department of Materials Science and Engineering Advanced Materials, Nanomaterials, Nanooperations and Nanotechnology Laboratory 01/07/2018-31/06/2019 Visiting faculty member University of Western Attica School of Engineering Department of Naval Engineering 01/10/2018-31/06/2019

Visiting faculty member Hellenic Open University School of Science and Technology Section of Applied Mathematics 01/10/2017-31/06/2020

Post-doctoral researcher Foundation for Research and Technology Institute of Chemical Engineering Sciences, Patras, Greece 01/02/2017-31/05/2018

Scientific collaborator School of Pedagogical and Technological Education Department of Mechanical Engineering Educators, Athens, Greece 16/02/2017-30/06/2017

Assistant Professor National Technical University of Athens School of Applied Mathematics and Physical Sciences Division of Mechanics, Athens, Greece 01/07/2016-31/08/2016

Scientific Collaborator Technological Educational Institute of Athens Department of Civil Engineering, Athens, Greece 29/02/2016-30/06/2016

Scientific collaborator School of Pedagogical and Technological Education Department of Mechanical Engineering Educators, Athens, Greece 08/11/2015-30/06/2016

Scientific visitor Okinawa Institute of Science and Technology Mathematics Soft Matter Unit, Okinawa, Japan 16/10/2015-07/11/2015

Post-doctoral researcher Institute of Mechanics of Materials Department of Civil Engineering Aristotle University of Thessaloniki, Thessaloniki, Greece 01/09/2015-30/06/2016

Post-doctoral researcher Foundation for Research and Technology Institute of Chemical Engineering Sciences, Patras, Greece 01/11/2012-31/08/2015 Dimitris Sfyris

Visiting Professor University of Chile, Santiago, Chile Department of Mechanical Engineering 01/07/2012-30/09/2012

University Lecturer University of Aegean, Greece 01/10/2011-30/06/2012

Post-doctoral researcher Technical University of Darmstadt, Germany Department of Civil Engineering and Geodesy Institute of Continuum Mechanics 01/04/2009-30/09/2011

Scientific collaborator Technological Institute of Kalamata, Greece Department of Telecommunications and Computing 01/10/2008-31/03/2009

## Teaching

Mechanics II-Strength of Materials Differential Equations (summer semester 2018-19) (University of Western Attica, Greece)

Mechanics I-Statics Probability-Statistics (winter semester 2018-19) (University of Western Attica, Greece)

Mathematical Prototypes in Natural Sciences (summer and winter semester 2017-2018, 2018-2019 one year course) (Hellenic Open University, Greece)-(Master level)

Strength of Materials II (summer semester 2016-2017) (School of Pedagogical and Technological Education, Greece)

Mechanics I (summer semester 2015-2016) (National Technical University of Athens, Greece) (Teaching assistant)

Mechanics I (summer semester 2015-2016) (Technological Educational Institute of Athens, Greece)

Strength of Materials II (summer semester 2015-2016) (School of Pedagogical and Technological Education, Greece)

#### Dimitris Sfyris

Strength of Materials I (winter semester 2015-2016) (School of Pedagogical and Technological Education, Greece)

Applied Elasticity (winter semester 2011-2012, south hemisphere) (University of Santiago, Chile) (Master level) (Lectures given in English)

Biostatistics (summer semester 2011-2012) (University of Aegean, Greece)

Statistics (summer semester 2011-2012) (University of Aegean, Greece)

Calculus (winter semester 2011-2012) (University of Aegean, Greece)

Continuum Mechanics II (summer semester 2010-2011) (TU Darmstadt, Germany) (Lectures given in English)

Plasticity Theory (winter semester 2010-2011) (TU Darmstadt, Germany) (Lectures given in English)

Tensor Calculus (summer semester 2009-2010) (TU Darmstadt, Germany) (Lectures given in English)

Continuum Mechanics I (winter semester 2009-2010, jointly with Prof.Dr-Ing. Tsakmakis) (TU Darmstadt, Germany) (Lectures given in English)

Continuum Mechanics II (summer semester 2008-2009) (TU Darmstadt, Germany) (Lectures given in English)

Mathematical Analysis I (winter semester 2008-2009) (TEI Kalamatas, Greece)

Mathematical Analysis II (winter semester 2008-2009) (TEI Kalamatas, Greece)

### Journal Reviewer

Journal of Elasticity • Mathematical Reviews • Mathematics • Frontiers in Chemistry • Continuum Mechanics and Thermodynamics • Nanoscale (Royal Society of Chemistry) • Carbon • Mechanics of Materials • Applied Mathematical Modeling • International Journal of Mechanical Science • European Journal of Mechanics A/Solids • Meccanica • SIAM Journal on Applied Mathematics • Proceedings of the Royal Society of London A • International Journal of Solids and Structures • International Journal of Nonlinear Mechanics • Zeitschrift fur Angewandte Mathematik und Physik • Mathematics and Mechanics of Solids • Advanced Composite Letters • Nanomaterials • Symmetry • Journal of Nanostructured Polymers and Nanocomposites • Microsystem Technologies • Lubricants • Journal of Inorganic and Organometallic Polymers and Materials

#### **Project Reviewer**

General Secretary of Research and Technology, Greece

National Science Center, Poland

## Supervision of master thesis (as the first supervisor)

D. Altanopoulos, "Uniqueness theorems in linear elasticity". Hellenic Open University (September 2021).

E. Mpouza, "Energy methods for a one dimensional nonlinear viscoelasticity model". Hellenic Open University (September 2020).

G. Iatrakis, "Oscillation of solutions and Sturm type theorems with applications to elastic beam theory". Hellenic Open University (September 2019).

#### Publications

#### Journal Articles

42. **D. Sfyris, R. Bustamante, K.R. Rajagopal**, On the hyperbolicity of the governing equations for the linearization of a class of implicit constitutive relations. *Mechanics Research Communications*, accepted.

**41. D. Sfyris**, Classical elastodynamics as a linear symmetric hyperbolic system in terms of  $(u_x, u_t)$ . *Journal of Elasticity*, accepted.

40. **D. Sfyris, G.I. Sfyris**, Linear elastic diatomic multilattices: three dimensional constitutive modeling and solutions of the shift vector equation. *Mathematics and Mechanics of Solids*, in press.

39. **D. Sfyris, G.I. Sfyris**, Linear theory of 2 and 3-monoatomic multilattices: solutions of the shift vector equation. *Continuum Mechanics and Thermodynamics*, 35 (2023) 1927-1942.

38. **D. Sfyris, G.I. Sfyris**, Breakdown of smooth solutions in one dimensional nonlinear nonlocal elasticity. *Mechanics Research Communications*, 129 (2023) 104092.

37. D. Sfyris, G.I. Sfyris, Constitutive modeling of three dimensional monoatomic linear elastic multilattices. *Mathematics and Mechanics of Solids*, 28 (2023) 973-988.

36. **D. Sfyris, G.I. Sfyris** Conditions for hyperbolicity and approximate Riemann invariants in one dimensional nonlinear nonlocal elasticity. *Mechanics Research Communications* 126 (2022) 104017, .

35. **D. Sfyris, D. Dragatogiannis, C. Charitidis**, Nonlinear elastic constitutive modeling of  $\alpha$ -Ge. *International Journal of Nonlinear Mechanics*, 134 (2021) 103737.

34. **G.D. Manolis, P.S. Dineva, T. Rangelov, D. Sfyris**, Mechanical models and numerical simulations in nanomechanics: A review across the scales. *Engineering Analysis with Boundary Elements*, 128 (2021) 149-170.

33. R. P. Deveja, E. P. Kritharis, D. C. Angouras, D. Sfyris, S. A. Papadodima, D. C. Iliopoulos, D. P. Sokolis, Effect of aneurysm and bicuspid aortic valve on layer-specific ascending aorta mechanics. *The Annals of Thoracic Surgery*, 106 (2018) 1692-1701.

32. **D. Sfyris, G.I. Sfyris**, Influence of partial blistering on the on the global and the local stress and couple stress field for a monolayer graphene resting on substrate. *Mathematics and Mechanics of Solids*, 33 (2018) 617-635.

31. **D. Sfyris**, Twinning mechanism and habit lines in monolayer-thick free-standing graphene: theoretical predictions. *International Journal of Engineering Science*, 113 (2017) 1-19.

30. **D. Sfyris, C. Galiotis**, Curvature dependent surface energy for free standing monolayer graphene. *Mathematics and Mechanics of Solids*, 21 (2016) 812-825.

29. **D. Sfyris**, On configurational weak phase transitions in graphene. *Continuum Mechanics and Thermodynamics*, 28, 1093-1110 (2016).

28. **P. Arrue, R. Bustamante, D. Sfyris**, A note on incremental equations for a new class of constitutive relation for elastic bodies. *Wave Motion*, 65, 44-54 (2016).

27. **D. Sfyris, G.I. Sfyris, R. Bustamante**, Nonlinear electro-magneto-mechanical constitutive modeling of monolayer graphene. *Proceedings of the Royal Society of London A*, 472, 20150750 (2016).

26. **D. Sfyris**, Phonon, Cauchy-Born and homogenized stability criteria for a free-standing monolayer graphene at the continuum level. *European Journal of Mechanics A/Solids*, 55, 134-148 (2016).

25. **D. Sfyris, E.N. Koukaras, N. Pugno, C. Galiotis**, Graphene as a hexagonal 2-lattice: evaluation of the in-plane material constants for the linear theory. A multiscale approach. *Journal of Applied Physics* 118, 075301 (2015).

24. **D. Sfyris, Ch. Androulidakis, C. Galiotis**, Graphene resting on substrate: closed form solutions for the perfect bonding and the delamination case. *International Journal of Solids and Structures* 71, 219-232 (2015).

23. C. Galiotis, O. Frank, E.N. Koukaras, D. Sfyris, Graphene mechanics: current status and perspectives. *Annual Reviews of Chemical and Biomolecular Engineering*, 6, 121-140 (2015).

22. **D. Sfyris, G.I. Sfyris, C. Galiotis**, Constitutive modeling of some 2D crystals: graphene, hexagonal BN, MoS2, WSe2 and NbSe2. *International Journal of Solids and Structures*, 66, 98-110 (2015).

21. D. Sfyris, R. Bustamante, On the treatment of non solvable implicit constitutive relations in solid mechanics. *Zeitschrift fur Angewandte Mathematik und Physik*, 66, 1165-1174 (2015).

20. **D. Sfyris**, A proposal for defining continuous distribution of dislocations for objective structures. *Continuum Mechanics and Thermodynamics*, 27, 399-407 (2015).

19. A. Ortiz-Bernardin, D. Sfyris, A finite element formulation for stressed bodies with continuous distribution of edge dislocations. *Acta Mechanica*, 226, 1621-1640 (2015).

18. **R. Bustamante, D. Sfyris**, Direct determination of stresses from the stress equations of motion and wave propagation for a new class of elastic bodies. *Mathematics and Mechanics of Solids*, 20, 80-91 (2015).

17. **A. Chasalevris, D. Sfyris**, Analytical evaluation of the finite journal bearing impedance forces using the exact analytical solution of the Reynolds equation. *Journal of Vibrational Engineering and Technologies*, 2, 423-432 (2014).

16. **D. Sfyris, G.I. Sfyris, C. Galiotis**, Curvature dependent surface energy for free standing monolayer graphene: geometrical and material linearization with closed form solutions. *International Journal of Engineering Science*, 85, 224-233 (2014).

15. **D. Sfyris, G.I. Sfyris, C. Galiotis**, Curvature dependent surface energy for free standing monolayer graphene: some closed form solutions of the nonlinear theory. *International Journal of Nonlinear Mechanics*, 67, 186-197 (2014).

14. Ch. Androulidakis, E. N. Koukaras, O. Frank, G. Tsoukleri, D. Sfyris, J. Parthenios, N. Pugno, K. Papagelis, K. S. Novoselov, C. Galiotis, Failure Processes in Embedded Monolayer Graphene under Axial Compression. *Scientific Reports*, 4, 5271 (2014).

13. **D. Sfyris**, Autoparallel curves and Riemannian geodesics for materially uniform but inhomogeneous bodies. *Mathematics and Mechanics of Solids*, 19, 152-167 (2014).

12. **D. Sfyris**, The role of the symmetry group on the non-uniqueness of the uniform reference. Case study: An isotropic solid body. *Mathematics and Mechanics of Solids*, 18, 738-744 (2013).

11. **D. Sfyris**, Replacing ordinary derivatives by gauge derivatives in the nonlinear continuum theory of dislocations to compensate for the action of the symmetry group. *Mechanics Research Communications*, 51, 56-60 (2013).

10. **D. Sfyris, R. Bustamante**, Use of some theorems related with the tensor equation AX + XA = H for some classes of implicit constitutive relations. *Quarterly Journal of Mechanics and Applied Mathematics*, 66, 157-163 (2013).

09. A. Chasalevris, D. Sfyris, Evaluation of the finite journal characteristics using the exact analytical solution of the Reynolds equation. *Tribology International*, 57, 216-234 (2013).

o8. **D. Sfyris, A. Chasalevris**, An exact analytical solution of the Reynolds equation for the finite journal bearing. Evaluation of the lubricant pressure. *Tribology International*, 55, 46-58 (2012).

o7. **C. Broese, D. Sfyris, Ch. Tsakmakis**, Isoclinic versus arbitrary rotated intermediate configuration in the case of gradient plasticity. *Composites B: Engineering*, 43, 2633-2645 (2012).

o6. **D. Sfyris**, Comparing the condition of strong ellipticity and the solvability of an elastic problem and the corresponding dislocated problem. *Mathematics and Mechanics of Solids*, 17, 254-265 (2012).

05. **D. Sfyris**, Propagation of a plane wave to a materially uniform but inhomogeneous body. *Zeitschrift fur Angewandte Mathematik und Physik*, 62, 927-936 (2011).

o4. **D. Sfyris**, The strong ellipticity condition under changes of the reference and the current configuration. *Journal of Elasticity*, 103, 281-287 (2011).

o3. **D. Sfyris, N. Charalambakis, V.K. Kalpakides**, Derivation of the material momentum equation from the energy balance. *Zeitschrift fur Angewandte Mathematik und Physik*, 60, 575-579 (2009).

o2. **D. Sfyris, N. Charalambakis, V.K. Kalpakides**, Continuously dislocated elastic bodies with a neo-Hookean like expression for the energy subjected to anti-plane shear. *Journal of Elasticity*, 93, 245-262 (2008).

o1. **D. Sfyris, N. Charalambakis, V.K. Kalpakides**, Variational arguments and NoetherâĂŹs theorem on the nonlinear continuum theory of dislocations. *International Journal of Engineering Science*, 44, 501-512 (2006).

#### Proceedings

**A. Chasalevris, D. Sfyris**, Analytical evaluation of the finite journal bearing impedance forces using the exact analytical solution of the Reynolds equation, The Eight International Conference on Vibration Engineering and Technology of Machinery (VETOMAC-VIII), Gdansk, Poland, September 3-7, 2012, pp. 36-42.

**A. Chasalevris, D. Sfyris**, On the analytical evaluation of the lubricant pressure in the finite journal bearing, The 4 th Conference on Mechanical Vibration and NoiseÃć ËŸ AÂÿ S2012 ASME International Design Engineering Technical Conferences (IDETC) August 12-15, 2012, Chicago, Illinois, USA, pp. 60-72.

**C. Broese, D. Sfyris, Ch. Tsakmakis**, Effect of the choice of plastic intermediate configuration on anisotropic and gradient plasticity, Hellenic Society for Theoretical and Applied Mechanics, Cyprus, July 12-14, 2010, pp. 145-152.

**D. Sfyris**, On strong ellipticity and solvability of continuously dislocated bodies, Hellenic Society for Theoretical and Applied Mechanics, Cyprus, July 12-14, 2010, pp. 121-128.

**D. Sfyris, V.K. Kalpakides, N. Charalambakis**, Continuously dislocated elastic bodies subjected to anti plane shear, The 8 th HSTAM International Congress on Mechanics, Patras, Greece, July 12-14, 2007, pp. 308-316.

**D. Sfyris, V.K. Kalpakides, N. Charalambakis**, On the force acting on dislocations within nonlinear elastostatics, The 2 th International Conference on Non-Smooth/Non-Convex Mechanics with applications in Engineering, AUTh, Thessaloniki, Greece, July 7-8, 2006, pp. 29-36.

**D. Bardzokas, G.I. Sfyris, D. Sfyris**, Antiplane mixed boundary value problem of electroelastic media, for a piezoelectric medium with defects in the form of holes, The 5 th National Conference of the Hellenic Society of Non Destructive Testing, NTUA, Athens, Greece, November 18-19, 2005, pp. 90-112.

### **Conference Talks**

C. Galiotis, C. Androulidakis, O. Frank, E. Koukaras, G. Tsoukleri, D. Sfyris, I. Polyzos, K. Novoselov, J. Parthenios, K. Papagelis, Mechanical Deformation of graphene and graphene-based nanocomposites, Trends in Nanotechnology, Seville, Spain, September 9-13, 2013.

**D. Sfyris**, An approach to the theory of continuously dislocated bodies by means of configurational mechanics, The 2 th International Conference on Material Modelling, Dortmund, Germany, September 15-17, 2009.

**D. Sfyris, V.K. Kalpakides, N. Charalambakis**, On the force acting on dislocations within nonlinear elastostatics, The 11 th Greek Conference on Analysis, AUTh, Thessaloniki, Greece, May 23-24, 2006.

**V.K. Kalpakides, D. Sfyris, N. Charalambakis**, Some variational arguments on the continuous theory of dislocations, The 1 th International Conference on Computational Mechanics, Belgrade, Serbia, November 15-17, 2004.

### Invited Talks

**D. Sfyris, G.I. Sfyris, E.N. Koukaras, C. Galiotis**, Modeling graphene at the continuum level: closed form solutions and molecular mechanics calculations, ESMC 2015, 9th European Solid Mechanics Conference Madrid, July 6 - 10, 2015

**D. Sfyris**, The Elastic and the Corresponding Dislocated Material: Definition, Strong Ellipticity, Solvability, The 8 th European Solid Mechancis Conference, Graz, Austria, July 9-15, 2012.

**D. Sfyris**, Propagation of a plane wave to a materially uniform but inhomogeneous body, The 7 th GRACM International Conference on Computational Mechanics, NTUA, Athens, Greece, June 30-July 2, 2011, pp. 120-130.

**D. Sfyris, Ch. Tsakmakis**, Plane progressive waves in micropolar bodies, Micromechanics and Modelling of Multifunctional Materials, AUTh, Thessaloniki, Greece, july 14-15, 2011.

#### Talks-Seminars

**D. Sfyris**, Continuum modeling of graphene, at the seminar held at the National Technical University, Department of Civil Engineering, Athens, Greece, 22 March 2019 (coordinator Prof. C. Charitidis).

**D.** Sfyris, Graphene at the continuum level: closed form solutions and molecular mechanics calculations, at the seminar held at the Institute of Applied and Computational Mathematics, Foundation for Research and Technology, Heraklion, Greece, o7 December 2018 (coordinator Prof. P. Rosakis).

**D. Sfyris**, Mechanics of thin Films: graphene and hBN at the linear and the nonlinear regime. Stress interpretation of graphene's Raman spectra, at the seminar held at the Theoretical and Physical Chemistry Institute, National Hellenic Research Foundation, Athens, Greece, 05 October 2017 (coordinator Prof. N. Lathiotakis).

**D.** Sfyris, Differential equations in mechanics, at the seminar held at the Department of Mathematics, University of Patras, Greece, 18 January 2017 (coordinator Prof. D.N. Georgiou).

**D. Sfyris**, Energy, stress and symmetry for a monolayer graphene at the continuum level, at the seminar held at the Department of Materials Science, University of Ioannina, Greece, 28 November 2013 (coordinator Prof. V.K. Kalpakides).

**D. Sfyris**, Some topics on the nonlinear continuum theory of dislocations, at the seminar held at the Department of Mathematics, University of Ioannina, Ioannina, Greece, 03 April 2013, 2013 (coordinator Prof. Th. Chorikis).

**D. Sfyris**, On a nonlinear continuum theory of dislocations, at the seminar held at the Department of Mechancial Engineering, University of Chile, Santiago, Chile, August 22, 2012 (coordinator Prof. R. Bustamante).

**D.** Sfyris, A constitutive approach to the nonlinear continuum theory of dislocations, at the seminar held at the Department of Materials Science and Engineering, University of Ioannina, March 6, 2012 (coordinator Prof. V.K. Kalpakides).

**D.** Sfyris, Continuously dislocated elastic bodies subjected to antiplane shear, at the open seminar held at the Department of Mathematics, Technical University of Darmstadt, Germany, June 2, 2009 (coordinator Prof. Dr. H.-D. Alber).

**D. Sfyris**, Remarks concerning ellipticity for finite elastic deformations of materially uniform but inhomogeneous bodies, Technical University of Darmstadt, Germany, November 11, 2009 (coordinator Prof. Dr. H.-D. Alber).

## Participation in research projects

Research associate for the program entitled "Tailor Graphene" under the framework of "ERC", Greece. Scientific director Prof. C. Galiotis, 01/02/2017-today.

Research associate for the program entitled "Deformation, Yield and Failure of Graphene and Graphenebased Nanocomposites" under the framework of "ERC-10", Greece. Scientific director Prof. C. Galiotis, 01/11/2012-31/08/2015.

Research associate for the program entitled "Study of some new constitutive laws for elastic bodies" under the framework of "Financiado por Fondecyt", Chile. Scientific director Prof. R. Bustamante.

Research associate for the program entitled "Constitutive equations and boundary conditions for the pseudomomentum equation" under the framework "Pythagoras II", 01/08/2005-31/10/2005 and 01/10/2006-31/12/2006. Scientific director Prof. V.K. Kalpakides.

# Pre-doctoral employment

Teaching assistant at the Department of Civil Engineering of the Aristotle University of Thessaloniki for the needs of the lesson "Strength of Materials II", 01/11/2003-01/06/2007. Scientific director Prof. N. Charalambakis.

## Technical reports

An analytical solution of the Reynolds equation for the finite journal bearing and evaluation of the lubricant pressure, Technical University of Darmstadt Library, 2012.

# Military Service

o6 November 2007-06 November 2008, Artillery. Rank: Private.

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