**Elias C. Aifantis**

**Education**

* Nat. Tech. Univ. Athens, Mining & Metallurgy (Diploma 1973); Univ. of Minnesota, Materials & Mechanics (Ph.D 1975).

**Appointments**

* University of Minnesota (Instructor: 1975-76); University of Illinois (Assistant Professor: 1976-80); University of Minnesota (Visiting Professor: 1980-82); Michigan Technological University, Houghton, USA (Professor 1982-90; Distinguished Research Professor 1990-2010; currently Emeritus Professor); Aristotle University, Thessaloniki, Greece (Professor 1990, after *special honorary invitation*); King Abdulaziz University (Distinguished Adjunct Professor: 2011- today ).

**Teaching and Research**

* *Undergraduate Courses* in Mechanics and Materials, Mechanical Behavior, Elasticity and Plasticity; *Graduate Courses* in Continuum Mechanics and Materials Science, Dislocation Theory, Micromechanics and Nanomechanics, Mechanics of Diffusion and Phase Transformations; *Training Seminars/Course Modules* in Summer Schools and Multi-University Curricula.

**Research Interests**

* Diffusion, Flow through Porous Media, Environmental Cracking, Phase Transformations, Micromechanics of Plasticity and Fracture, Material Instabilities: Dislocation Patterning / Shear Banding / Damage Localization, Soil / Rock Mechanics, Nanostructured Materials. [**Coined** the terms *Double Diffusivity*, *Chemomechanics*, *Material Instabilities*, *Dislocation Patterning*, *Nanomechanics*].

**Publications/Citations**

* ***Published*** over **500** articles in scientific journals/book chapters and proceedings.
* ***Citations*:** ~**8100** citations and **44** h-index (ISI); ~**8050** citations and **43** h-index (Scopus).
* ***ISIHighlyCited.com*:** Included in the ISI Web of knowledge list of most highly cited authors in the world: ENGINEERING (3rd entry no. A0086-2010-N out of 262; Late Academician Theocaris is the only other one in Greek Institutions included in this list).
* ***3 most Highly Cited Articles with Single Authorship:*** **E.C. Aifantis**, On the microstructural origin of certain inelastic models, *ASME J. Engng. Mat. Tech.* **106**, 326-330 (1984). [ISI: 477, Scopus: 559; *5th mostly cited article of the Journal*; IF: 0.695]; **E.C. Aifantis**, The Physics of plastic deformation, *Int. J. Plasticity* **3**, 211-247 (1987). [ISI: 456, Scopus: 324; *2nd mostly cited article of the Journal*; IF: 5.082]; **E.C. Aifantis**, On the role of gradients in the localization of deformation and fracture, *Int. J. Engrg. Sci.* **30**, 1279-1299 (1992). [ISI: 276, Scopus: 270; *13th mostly cited article of the Journal*; IF: 1.194]
* ***Research Topics Pioneered by the PI Discussed in Books Published by Other Distinguished Authors:*** Over the years,the PI’s research has stimulated the organization of various workshops/conferences and the publication of Journal Special Issues. ***Chapter 89*** of a book by **M. Gurtin/E. Fried/L. Anand** (*The Mechanics and Thermodynamics of Continua*, *Cambridge Univ. Press, UK, 2010*) is dedicated to his theory of “gradient plasticity” and ***Chapter 6*** of a previous book by Nobel Laureate **I. Prigogine and G. Nicolis** (*Exploring Complexity*, *Freeman, New York, 1989*) is dedicated to his approach (with D. Walgraef) on dislocation patterning. A discussion of the Walgraef-Aifantis (W-A) model on PSBs formation is also provided in ***Chapter 2.6*** of a book by **S. Suresh** (*Fatigue of Materials*, *Cambridge Univ. Press, UK, 1991*) and in ***Chapter 2.7.3*** of the 2nd Edition, 2001. Finally, his theory on “gradient elasticity” as applied to elimination of singularities from dislocation lines is the subject of ***Chapter 3.1.1*** of another recent book by **M.Yu. Gutkin and I.A. Ovid’ko** (*Plastic Deformation in Nanocrystalline Materials, Springer-Verlag, Berlin-Heidelberg-New York, 2004*). The W-A model is also discussed extensively in a recent book by **N. Ghoniem and D. Walgraef** (*Instabilities and Self-Organization in* Materials, *Oxford Univ. Press, UK, 2008*).

**Funding ID**

* Greek National Strategic Reference Framework (NSRF): “Funding of Research Projects Positively Reviewed in the 5th ERC Grant Schemes Call”: Internal Length Gradient Mechanics Across Scales and Materials: Theory, Experiments and Applications/*IL-GradMech-ASM*” (2013-2015, 886 k€), where he acts as PI
* Multi-investigator project from EU: ERA.NET-RUS “STProjects-219/NanoPhase: Shift of the phase equilibria in nanograined materials” (2012-2014, 207k€), where he acts as co-PI.
* Multi-investigator project from the Greek Ministry of Education: THALES “*INTERMONU: Conservation and Restoration of Monuments of Cultural Heritage*” (2012-2015, 600k€), where he acts as co-PI.
* Currently his Lab is hosting: K.E. Aifantis – the youngest recipient ever of an ERC Starting Grant (MINATRAN 211166, 2008-2013, 1.130k €) [*BBC* - http://news.bbc.co.uk/2/ hi/science/nature/7264828.stm), *Science Careers* - http://sciencecareers.sciencemag.org/career\_ development/previous\_issues/articles/2008\_03\_21/caredit\_a0800043; *Physics Today* - April 2008 issue, pp.30-31]
* The previous total research funding as Principal Investigator has been over 10 million dollars, as follows:
* ***US:*** Continuous funding (1976-2008) from the US National Science Foundation/*NSF*. Also funding from the US Air Force Office of Scientific Research/*AFOSR*, US Army Research Office/*ARO*, US National Academy of Sciences/NAS, US National Research Council/*NRC*, Naval Research Laboratory/*NRL*, Sandia National Labs/*SNL*, *NATO*.
* ***EU:*** Continuous funding (1991-2007) through the **Coordination/PI** of: HCM: ΕRBCHBGCT 920041 *Fellowships in Mechanics of Materials*, 240k €; TMR-Network: ERBFMRXCT960062 *Spatio-Temporal Instabilities in Deformation and Fracture*, 1.760k €; RTN: HPRN-CT-2002-00198, *Deformation and Fracture Instabilities in Novel Materials and Processes/DEFINO*, 1.500k €; INTAS-93-3213 *Physics and Mechanics of Plastic Instabilities in Novel Materials*, 70k €; INTAS-94-4380 *Structure, Deformation and Fracture of Nanophase Materials*, 24k €. Also, his Lab hosted: A. Romanov – an internationally established scholar in dislocation theory – through an IIF Marie Curie Fellowship (PIIF-GA-2008-220419, 2009-2011, 200.000 €). Also **Partner in**: RTN: HPRN-CT-2002-00220, *Degradation and Instabilities in Geomaterials with Application to Hazard Mitigation/DIGA*, (AUT funding 175k €); REVISA: PL 960292, *Reactor Vessel Integrity in Severe Accidents*, (AUT funding 240k €); LISSAC: FIKS-CT1999-00012, *Limit Strains for Severe Accident Conditions*, (AUT funding 90k €).
* ***GR:*** Funding from the Greek General Secretariat of Research and Technology and the Ministry of Education (2000-2007) through the **Coordination/PI** of: ARISTEIA II - SEDEMP 5152: *Size Effects in Deformation and Electromechanical Problems*, 318k €; ERC-13: *Internal Length Gradient Mechanics Across Scales and Materials: Theory, Experiments and Applications*, 886k €; PYTHAGORAS: *Pattern formation and self-organization in macro/meso/microscale and nanoscale: Bridging the length scales with applications to nanomechanics and nanotechnology*, 50k €; PENED 01: *Nanomechanics, Nanoindenter and Nanocoatings*, 42.000k DRS; PENED 99: *Gradient Theory, Stochasticity and Self-Organization: Applications in Nanomaterials, Industrial Materials and Biocompatible Epilayers*, 57.000k DRS.

**Students/Postdocs**

* ***Advised*** ~25 PhDs, worked with ~35 postdocs and visiting scholars. Many of these hold university positions in the US, EU, Russia and China. Also interacted with a large number of distinguished collaborators throughout the world.
* ***Coordinator*** of Research Training Networks as listed above and ***Founding Member*** of *NUE: Undergraduate Exploration of Nano-Science* (http://nano.mtu.edu/ nueindex.htm) at MTU, as well as of a similar Graduate Program at AUT on *Nanosciences and Nanotechnologies/NN* (http://nn.physics.auth.gr/ ensite/index.htm).

**Seminars**

* Invited in over 500 occasions to speak in conferences, universities, and research laboratories in USA, Europe, FSU, Russia, Australia, Japan, South Africa, Brazil, China.
* Chairman of 10 international conferences/symposia and member of ~30 organizing committees.
* Joint ASME/ASCE/SES Symposium held in his honour, 1-3 June 2005, Baton Rouge, USA.

**Editorships and Editorial Boards**

* **Edited** 12 Books, Special Journal Issues and Conference Proceedings, including: **E.C. Aifantis and J.P. Hirth**, *The Mechanics of Dislocations* [248 pages], ASM, Metals Park, 1985**;** **E.C. Aifantis and J. Gittus**, *Phase Transformations* [302 pages], Elsevier Appl. Sci. Publ., London-New York, 1986.
* ***Editor***of the *J. Mechanical Behavior of Materials* (ISSN 0334-8938)**;** ***Honorary Editor***of *Computer and Experimental Simulations in Engineering and Science* (ISSN 1791-3829). ***On the Advisory/Editorial Board of:*** *Reviews on Advanced Materials Science* (ISSN 1605-8127)**;** *Materials Physics and Mechanics* (ISSN 1605-8119)**;** *Acta Mechanica Solida Sinica* (ISSN 0894-9166)**;** *Mechanical Sciences* (ISSN 2191-9151)**;** *J. Control Engineering and Technology* (ISSN 2223-2036)**;** *Open Mechanics Journal* (ISSN 1874-1584)**,** *Materials Science*, as well as *Materials Sciences & Applications* (currently being placed in Citation Index). **[Formerly:** *Acta Mechanica* (ISSN 0001-5970), *J. Nano Research* (ISSN 1662-5250)**;** *Mechanics of Cohesive-Frictional Materials* (ISSN 1099-1484)**;** *Numerical and Analytical Methods in Geomechanics* (ISSN 106-222).]

**Top 10 publications**

1. E.C. Aifantis, Gradient Nanomechanics: Applications to deformation, fracture, and diffusion in nanopolycrystals, *Metal. Mater. Trans. A* **42**, 2985-2998, 2011. [Selected for an ASM author award by ASM International – Also granted free internet access by the Publisher]

2. E.C. Aifantis, On the gradient approach - Relation to Eringen's nonlocal theory, *Int. J. Engng. Sci.* **49**, 1367-1377, 2011. [Special Volume dedicated to the memory of A.C. Eringen – by invitation only]

3. H. Askes and E.C. Aifantis, Gradient elasticity in statics and dynamics: An overview of formulations, length scale identification procedures, finite element implementations and new results, *Int. J. Solids Stuct.* **48**, 1962-1990, 2011 [Scopus 4; ISI 3]

4. E.C. Aifantis, Exploring the applicability of gradient elasticity to certain micro/nano reliability problems, *Microsystem Technologies* **15**, 109-115, 2009. [Scopus 19; ISI 19]

5. E.C. Aifantis, Deformation and failure of bulk nanograined and ultrafine-grained materials, *Mater. Sci. Engng. A* **503**, 190-197, 2009. [Scopus 8]

6. E.C. Aifantis, On scale invariance in anisotropic plasticity, gradient plasticity and gradient elasticity, *Int. J. Engng. Sci.* **47**, 1089-1099, 2009. [Scopus 5; ISI 7]

7. A.E. Romanov, A.L. Kolesnikova, I.A. Ovid'ko and E.C. Aifantis, *Mater. Sci. Eng. A* **503**, 62-67, 2009 [Scopus 6; ISI 7]

8. M. Lazar, G.A. Maugin and E.C. Aifantis, On a theory of nonlocal elasticity of bi-Helmholtz type and some applications, *Int. J. Solids Struct.* **43**, 1404-1421, 2006. [Scopus 24; ISI 24]

9. M. Zaiser, F. M. Grasset, V. Koutsos and E.C. Aifantis, Self-Affine Surface Morphology of Plastically Deformed Metals, *Phys. Rev. Lett.* **93**, 195507, 2004. [Scopus 45; ISI 42]

10. E.C. Aifantis, Update on a class of gradient theories, *Mechanics of Materials* **35**, 259-280, 2003. [Scopus 128; ISI 123]

**Research monographs, chapters in collective volumes and any translations thereof.**

* E.C. Aifantis, A personal view on current generalized theories of elasticity and plastic flow, in: *Mechanics of Generalized Continua: One Hundred Years after the Cosserats*; Adv. in Mechanics and Mathematics, Eds. G.A. Maugin and A.V. Metrikine, Springer, pp. 191-202, 2010.
* E.C. Aifantis, *Lessons in Strength of Materials and Continuum Mechanics* (in Greek), Grapholine Publ., 2010, ISBN: 978-960-8143-48-7.

**Invited presentations (last 7 years – partial list)**

* *SES 49th Annual Tchnical Meeting 2012, 10-12 October 2012, Atlanta, US* ***(Keynote)***
* *XI Int. Conference on Nanomaterials, Rhodes, 26-31 September 2012, Rhodes, Greece* ***(Keynote)***
* *MS&T 2011, Acta Materialia Gold Medal Symposium, 17 October 2011, Columbus, USA (****Keynote****)*
* *10th Asia-Pacific Conference on Engineering Plasticity and its Applications (AEPA-2010), 15-17 November 2010, Wuhan, China (****Plenary****)*
* *2nd Biennial Symposium of Predictive Science & Technology in Mechanics & Materials, 22-25 June 2010, Starkville, USA*
* *1st TMS-ABM International Materials Congress, 26-30 July 2010, Rio de Janeiro, Brazil. (****Keynote****)*
* *Advances in Continuum Mechanics and Thermodynamics, 30 June 30 – 2 July 2010, Bochum, Germany*
* *5th International Conference on Materials Science and Condensed Matter Physics (MSCMP 2010), 13-17 September 2010, Chisinau, Moldova (****Plenary****)*
* *Solid Mechanics Conference/SOLMECH 2010, 6-10 September 2010, Warsaw, Poland (****Keynote****)*
* *2010 ASME International Leadership Summit – Mechanical/Multidisciplinary Engineering Education, 26-29 May 2010, Istanbul, Turkey (****Plenary****)*
* *SEM Annual Conference & Exposition on Experimental and Applied Mechanics, 1-4 June 2009, Albuquerque, New Mexico, USA (****Keynote****)*
* *EUROMECH Colloquium 510: Mechanics of Generalized Continua: One hundred years after the Cosserats, 13-16 May 2009, Paris, France (****by Invitation only****)*
* *4th IASME/WSEAS Int. Conference on Continuum Mechanics, 24-26 February 2009, Cambridge, UK*
* *4th International Conference on Multiscale Materials Modeling/MMM2008, 27-31 October 2008, Tallahassee, USA (****Keynote****)*
* *6th South African Conference on Computational and Applied Mechanics (SACAM2008), 26-28 March 2008, Cape Town, South Africa (****Plenary****)*
* *International Symposium on Bulk Nanostructured Materials (BNM 2007),* 14-18 August 2007, Ufa, Russia (**Keynote**)
* *IUTAM Symposium Multi-Scale Plasticity of Crystalline Materials,* 5-9 November 2007, Eindhoven, The Netherlands (**by Invitation only**)
* *16th European Conference on Fracture (ECF-16)*,2-8 July 2006, Alexandroupolis, Greece (**Plenary**)

**Organisation of International Conferences and Symposia**

1. Title: *International Summer School on Multiscale Material Mechanics and Engineering Sciences*

Function: *Organizer & Chair* Place/Date: *Epanomi, Greece,* *21–30 August 2010*

2. Title: *International Workshop on Engineering Education Perspectives – A Balkan Case-Study*

Function: *Organizer & Chair* Place/Date: *Thessaloniki, Greece,* *31 May–1 June 2010*

3. Title: *2nd World Symposium on Multiscale Material Mechanics and Engineering Sciences*

Function: *Organizer & Chair* Place/Date: *Thessaloniki, Greece,* *21–22 May 2009*

4. Title: *1st International Conference from Nanoparticles & Nanomaterials to Nanodevices & Nanosystems*

Function: *Co-Organizer & Co-Chair* Place/Date: *Halkidiki, Greece,* *16–18 June 2008*

5. Title: *1st World Symposium on Multiscale Material Mechanics and Engineering Sciences*

Function: *Organizer & Chair* Place/Date: *Thessaloniki, Greece,* *29 April–3 May 2007*

6. Title: *19th Panhellenic Conference/Summer School Nonlinear Science and Complexity*

Function: *Co*-*Organizer & Co-Chair* Place/Date: *Thessaloniki, Greece,* *10–22 July 2006*

7. Title: *Physical Aspects of Multiscale Modeling Workshop: “Solid Mechanics” and “Micro and Nano–structures”.* Responsible Scientific Society: *U.S. Army Research Office (ARO)*

Function: *Co-Organizer.* Place/Date: *Bled, Slovenia, 13–15* *September 2004*

8. Title: *5th EUROMECH Solid Mechanics Conference (ESMC–5)*

Responsible Scientific Society: *European Mechanics Society*

Function: *Organizer & Chair* Place/Date: *Thessaloniki, Greece,* *17–23 August 2003*

**International Prizes/Awards/Academy memberships (Title, Institution, Year)**

* *Joint ASME/ASCE/SES Symposium Honoring the Contributions of Elias Aifantis*, 1-3 June 2005, Baton Rouge, USA.
* *Distinguished Adjunct Professor* in the King Abdulaziz University, Jeddah, Saudi Arabia.
* *Selected for an ASM Author Award by ASM International* for his article E.C. Aifantis, *Metal.* *Mater. Trans. A* **42**, 2985-2998, 2011.

**Major contributions to early careers of excellent researchers**

* *Scientific Mentorship*: A considerable number of PI’s undergraduate students and postdocs hold academic positions in the US, Europe, Russia and Greece*:* H. Zbib (Professor and Head - Washington State University - USA), D. Bammann (Professor - Mississippi State University/formerly at Sandia Labs - USA), D. Unger (Professor - University of Evansville - USA), M. Zaiser/Edinburgh (Professor and Head), H. Askes/Sheffield (Professor and Head), M. Gutkin/St. Petersburg, M. Seefeldt/Leuven, M. Lazar/Darmstadt, K.-Y. Xu (Professor - Shanghai University - China), X. Zhang (Lecturer - Southwest Jiaotong University - China), I. Chasiotis (Associate Professor - University of Illinois at Urbana-Champaign - USA), I. Mastorakos (Research Professor - Washington State University - USA), K. Kalaitzidou (Assistant Professor - Georgia Tech - USA), A. Konstantinidis (Assistant Professor - Aristotle University of Thessaloniki - Greece), M. Avlonitis (Lecturer - Ionion University - Greece), G. Efremidis (Lecturer - University of Thessaly - Greece), I. Tsagrakis (Part time Lecturer - University of Crete - Greece). [Shorter term visitors through TMR/RTN fellowships in Academia include: M. Ferro/Torino, C. di Prisco/Milano, N. Pugno/Torino, P. Cornetti/Torino, G. Ribarik/Budapest, H.-P. Gänser/Leoben, P. Grammenoudis/Darmstadt, J.V. Andersen/Paris. Others in Research Institutions/Industry include: V. Gruetzun, F. Hagemann, Th. Putelat, G. Rambert, F. Tzschicholz.]
* *Additional Scientific Mentorship*: It is worth noting that three individuals that have been associated with ECA’s laboratory and benefited from interactions with him have won the most prestigious ERC grants: Katerina Aifantis and Nicola Pugno have been awarded ERC starting grants in 2008 and 2011 respectively, and Athanasios Konstantopoulos – whom the PI recruited as a graduate student to Michigan Tech and later supported for a short period at AUT as postdoc – has recently been awarded a Senior ERC grant in 2010. [Currently he is Director of CERTH.]