

Section b: Curriculum vitae (max. 2 pages)

PERSONAL INFORMATION

Family name, First name: **AIFANTIS, ELIAS**

Researcher unique identifier(s): **Research ID F-7087-2011**

Nationality: **HELLENIC**

Date of birth: **10 October 1950**

URL for web site: **http://users.auth.gr/users/0/3/022730/public_html/index3.htm**

• EDUCATION

1975 PhD, Materials & Mechanics, Univ. of Minnesota, USA

1973 Diploma, Mining & Metallurgy, Nat. Tech. Univ. Athens, Greece

• CURRENT POSITION(S)

2010 – today, Emeritus Professor, Michigan Technological University, Houghton, USA; 1990 – today, Professor (after special *honorary invitation*), Aristotle University, Thessaloniki, Greece

• PREVIOUS POSITIONS

2011 – 2014, Distinguished Adjunct Professor, King Abdulaziz University, Jeddah, Saudi Arabia; 1990 – 2010, Distinguished Research Professor, Michigan Technological University, Houghton, USA; 1982 – 1990, Professor, Michigan Technological University, Houghton, USA; 1980 – 1982, Visiting Professor, University of Minnesota, Minneapolis, USA; 1976 – 1980, Assistant Professor, University of Illinois, Champaign, USA; 1975 – 1976, Instructor, University of Minnesota, Minneapolis, USA

• PUBLICATIONS / CITATIONS

- **Published** ~520 articles in scientific journals/book chapters and proceedings.
- **Citations:** ~6400 citations and 43 h-index (ISI); ~5700 citations and 34 h-index (Scopus).
- **ISI Highly Cited.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 276).
- **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: 526, Scopus: 617; 5th most cited article of the Journal]; E.C. Aifantis, The Physics of plastic deformation, *Int. J. Plasticity* **3**, 211-247 (1987). [ISI: 487, Scopus: 359; 5th most cited article of the Journal]; E.C. Aifantis, On the role of gradients in the localization of deformation and fracture, *Int. J. Engrg. Sci.* **30**, 1279-1299 (1992). [ISI: 258, Scopus: 269; 15th most cited article of the Journal]
- **PI's Research Discussed/Featured as Chapters in Books/Monographs by Distinguished Authors:** 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)*.

• SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

1990 – today ~30 Postdocs/13 PhD/7 MS Students, Aristotle University, Thessaloniki, Greece

1982 – 2010 ~15 Postdocs/7 PhD/10 MS Students, Michigan Technological University, USA

1980 – 1982 2 Postdocs, University of Minnesota, USA

1976 – 1980 3 Postdocs/6 PhD/2 MS Students, University of Illinois, USA

- **Advised or Co-advised** ~30 PhDs, worked with ~50 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 3 EU Research Training Networks: TMR-Network: ERBFMRXCT960062, *Spatio-Temporal Instabilities in Deformation and Fracture*; RTN: HPRN-CT-2002-00198, *Deformation and Fracture Instabilities in Novel Materials and Processes/DEFINO*; RTN: HPRN-CT-2002-00220, *Degradation and Instabilities in Geomaterials with Application to Hazard Mitigation/DIGA*

- **Founding Member** of 2 Undergraduate/Graduate Educational Programs: *NUE: Undergraduate Exploration of Nano-Science* (<http://nano.mtu.edu/nueindex.htm>) at MTU; Graduate Program at AUTH on *Nanosciences & Nanotechnologies/NN* (<http://nn.physics.auth.gr/ensite/index.htm>).

- **Organizer** of several Summer Schools in these areas.

- **TEACHING ACTIVITIES**

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.

- **INSTITUTIONAL RESPONSIBILITIES**

2000 – today Member of the Executive Committee of Graduate Program on *Nanosciences & Nanotechnologies/NN*, Aristotle University, Thessaloniki, Greece

1990 – 2014 Director of the Laboratory of Mechanics, Aristotle University, Thessaloniki, Greece

1990 – 2013 Director of the Division of Mechanics, Aristotle University, Thessaloniki, Greece

- **MAJOR COLLABORATIONS**

Ongoing research with *A. Romanov/M. Gutkin/I. Ovid'ko/N. Morozov*, Dislocations/disclinations and Nanomechanics, Russian Academy of Sciences, Russia; *H. Zbib*, Gradient plasticity and Shear banding, Washington State University, USA; *D. Walgraef*, Dislocation patterning, Free University of Brussels, Belgium; *Y. Estrin*, NC/UFG materials and Plastic instabilities, Monash University, Australia; *W. Milligan/S. Hackney*, Nanocrystalline materials, Michigan Technological University, USA; *C.-Q. Ru*, Gradient elasticity, University of Alberta, Canada; *M. Zaiser*, Slip avalanches, University of Erlangen-Nurnberg, Germany; *H. Askes*, Gradient elasticity, University of Sheffield, UK; *G. Maugin*, Dislocations, Université Paris VI, France.

Previous major collaborations with *J. Serrin*, Regents Professor of Mathematics at the University of Minnesota, on fluid interfaces and Nobel Laureate *I. Prigogine's* group in Brussels led to the development of gradient plasticity and dislocation patterning – both popular subjects actively pursued today by material mechanics and material physics researchers worldwide. Earlier than that he developed a mechanics theory for mass and heat transport in high diffusivity paths and flow in double porosity media, which has also become an active field of research today. And later together with *W. Milligan* and *S. Hackney* were the first to unravel experimentally the plasticity mechanisms at the nanoscale (grain rotation, multiple shear banding) and develop models for interpreting such processes. Finally, his gradient elasticity theory which led to the elimination of singularities at dislocations and crack tips is also actively pursued today.

- **SEMINARS/CONFERENCES/SPECIAL SYMPOSIA**

- 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 ~12 international conferences/symposia and member of ~30 organizing committees.
- Joint ASME/ASCE/SES Symposium held in his honor (on the occasion of his 55th birthday), 1-3 June 2005, Baton Rouge, USA.
- FLOGEN Star OUTREACH Special Symposium in his honor (on the occasion of his 65th birthday), October 2015, Antalya, Turkey.

- **EDITORSHIPS / 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); **Advisory/Editorial Board Member** 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); *Mechanical Sciences* (Open Access); *Aerospace Science and Technology* (ISSN 1270-9638); *Open Conference Proceedings Journal* (ISSN 2210-2892), *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).]

Section c: Ten years track-record (max. 2 pages)

1. Top 10 publications

1. E.C. Aifantis, Gradient material mechanics: Perspectives and prospects, *Acta Mech.* **225**, 999-1012 (2014). [Scopus 0; ISI 0]
2. E.C. Aifantis, On non-singular GRADELA crack fields, *Theor. Appl. Mech. Lett.* **4**, 5-051005, 2014. [Scopus 0; ISI 0]
3. V.E. Tarasov and E.C. Aifantis, Non-standard extensions of gradient elasticity: Fractional non-locality, memory and fractality, *Communic. Nonlin. Sci. Numer. Simul.*, doi: <http://dx.doi.org/10.1016/j.cnsns.2014.10.002>, 2014. [Scopus 0; ISI 0]
4. E.C. Aifantis, Gradient Nanomechanics: Applications to deformation, fracture, and diffusion in nanopolycrystals, *Metal. Mater. Trans. A* **42**, 2985-2998, 2011. [Scopus 5; ISI 7; Selected for an ASM author award by ASM International – Also granted free internet access by the Publisher]
5. E.C. Aifantis, On the gradient approach - Relation to Eringen's nonlocal theory, *Int. J. Engng. Sci.* **49**, 1367-1377, 2011. [Scopus 26; ISI 21; Special Volume dedicated to the memory of A.C. Eringen – by invitation only]
6. 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 Struct.* **48**, 1962-1990, 2011 [Scopus 66; ISI 69]
7. S. Forest and E.C. Aifantis, Some links between recent gradient thermo–elasto–plasticity theories and the thermomechanics of generalized continua, *Int. J. Solids Struct.* **47**, 3367-3376 (2010). [Scopus 21; ISI 26]
8. E.C. Aifantis, Exploring the applicability of gradient elasticity to certain micro/nano reliability problems, *Microsystem Technologies* **15**, 109-115, 2009. [Scopus 27; ISI 35]
9. M. Zaiser and E.C. Aifantis, Randomness and slip avalanches in gradient plasticity, *Int. J. Plasticity* **22**, 1432-1455, 2006. [Scopus: 22; ISI 0]
10. 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 44; ISI 48]

2. 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.

3. Invited presentations (last 2 years – partial list)

7th Int. Conference on Multiscale Materials Modeling, 6-10 October 2014, Berkeley, US (**Invited**); 12th Int. Conference on Numerical Analysis and Applied Mathematics, 22-28 September 2014, Rhodes, Greece (**Invited**); 7th Int. Conference on Materials Science and Condensed Matter Physics, 16-19 September 2014, Chisinau, Moldova (**Plenary**); 11th Int. Conference on Nanosciences and Nanotechnologies, 8-11 July 2014, Thessaloniki, Greece (**Invited**); 6th Int. Conference on Nanomaterials by Severe Plastic Deformation, 30 June - 4 July 2014, Metz, France (**Invited**); Shechtman International Symposium (dedicated to 2011 Nobel Prize Winner in Chemistry D. Shechtman), 29 June-7 July 2014, Cancun, Mexico (**Invited**); 10th Int. Conference of Computational Methods in Sciences and Engineering, 4-7 April 2014, Athens, Greece (**Invited**); TMS 2014, Annual Meeting and Exhibition, 16-20 February 2014, San Diego, USA (**Invited**); 2nd Global Conference on Materials Science and Engineering, 20-22 November 2013, Xianning, China (**Keynote**); 3rd Int. Conference on Material Modelling, September 8 – 11 2013, Warsaw, Poland (**Invited**); 6th International Conference on Nonlinear Mechanics, 12- 15 August 2013, Shanghai, China (**Keynote**); Nano-Mechanical Interfaces Multiphysics Theory and Experiments, 4-9 August 2013, Hong Kong, China (**Invited**); SES 50th Annual Technical Meeting and ASME-AMD Annual Summer Meeting, 28-31 July 2013, Brown, USA (**Invited**); 13th International Conference on Fracture, 16-21 June 2013, Beijing, China (**Invited**); 13th Pan-American Congress of Applied Mechanics, 22-24 May 2013, Houston, Texas (**Invited**)

4. Organisation of International Conferences and Symposia (last 2 years – partial list)

1. Title: 12th International Conference on Numerical Analysis and Applied Mathematics
Function: Mini Symposium Co-Organizer Place/Date: Rhodes, Greece, 22–28 September 2014
2. Title: 7th International Conference on Materials Science and Condensed Matter Physics
Function: Program Committee Member Place/Date: Chisinau, Moldova, 15-19 September 2014
3. Title: 9th International Conference on Engineering Computational Technology

- Function: *Editorial Board Member* Place/Date: *Naples, Italy, 2–5 September 2014*
4. Title: *International Workshop on Multiscale Gradient Material Mechanics: Applications to Engineering, Biology, Medicine*
 Function: *Organizer & Chair* Place/Date: *Thessaloniki, Greece, 4–6 August 2014*
5. Title: *Shechtman International Symposium (dedicated to 2011 Nobel Prize Winner in Chemistry D. Shechtman)*
 Function: *Co-Organizer* Place/Date: *Cancun, Mexico, 29 June-4 July 2014*
6. Title: *The 2013 International Conference on Biology, Medical Physics, Medical Chemistry, Biochemistry and Biomedical Engineering*
 Function: *Program Committee Member* Place/Date: *Venice, Italy, 28-30 September 2013*

5. International Prizes/Awards/Academy memberships (if applicable) (Title, Institution, Year)

- *Russian Government Distinguished Visiting Professor-Research Fellowship*, ITMO University, St. Petersburg, Russia, 2014.
- *Chinese Government Distinguished High-end Foreign Expert Fellowship*, Southwest Jiaotong University, Chengdu, China, 2014.
- *Distinguished Adjunct Professor* in the King Abdulaziz University, Jeddah, Saudi Arabia (2011-14).
- One of the three Greek Researchers whose contributions are summarized in a history of Mechanics book by A. Maugin (G.A. Maugin, *Continuum Mechanics Through the Twentieth Century: A Concise Historical Perspective*, Springer, Dordrecht, 2013).
- *Selected for an ASM Author Award by ASM International* for his article E.C. Aifantis, *Metal. Mater. Trans. A* **42**, 2985-2998, 2011.
- *Joint ASME/ASCE/SES Symposium Honoring the Contributions of Elias Aifantis*, 1-3 June 2005, Baton Rouge, USA.
- *Finalist for ASME's Koiter's Award ~15 years ago*, Declined for personal reasons (it was awarded, instead to J. Maier).
- *Japanese Government Imo Senior Visiting Fellowship*, 1995.
- *MTU Research Award*, Michigan Technological University, USA, 1993.
- *US Academy of Sciences Fellowship for Imo visit to USSR*, 1987.
- *Special Honorary Invitation (Metaklisi)* by Aristotle University of Thessaloniki for a Mechanics Professorship (1989; Accepted). Such a honorary invitation by the University was extended before only to his predecessor Prof. G. Lianis of Purdue (subsequently a Minister of Research and Development in Greece and later Ambassador to Japan).

6. Major contributions to early careers of excellent researchers (if applicable)

- *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 - Southeast Jiaotong University - China), I. Chasiotis (Associate Professor - University of Illinois at Urbana-Champaign - USA), I. Mastorakos (Assistant Professor - Clarkson University - USA), K. Kalaitzidou (Assistant Professor - Georgia Tech - USA), A. Konstantinidis (Assistant Professor - Aristotle University of Thessaloniki - Greece), A. Kalampakas (Assistant Professor - American Univ of The Middle East - Kuwait), 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 an Advanced ERC grant in 2010 [currently he is Director of CERTH.]