George I. Tsamasphyros
Professor

EDUCATION:

1. Diploma in Civil Engineering N.T.U.A., 1967
2. Master's Degree (D.E.A.) in Applied Mathematics / Mechanics, Université Paris VI, 1971
3. Doctorate (Doctorat d´ Etat és science Physique), Université Paris VI, 1973, Thésis : "Contribution a l'étude de la Répartition des Contraintes et Déformations dans les Multi lames de Longueur Finie sous l' Effet des Variations Dimensionnelles Propres aux Matériaux. Constitutifs en Tenant Compte des Singularités aux Extrémités"

COMMUNICATION INFORMATION:

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RESEARCH INTERESTS:

The research, at its main part, belongs in the area of Computational Mechanics, covering a wide spectrum of it (Finite Element Method, Integral Equations, Boundary Element Method, Integral Transformations, Finite Differences, and Finite Volumes). Special emphasis is given in to finding new methods for calculating the error and the convergence of these methods. The boundary value problems which are confronted, concern elasticity problems, fracture mechanics, as well as materials with microstructure (gradient, nonlocal micropolar etc elasticity) and coupled fields –

piezo-electric materials, composite materials, structure repair, wear and fatigue of materials, as well as biomechanics issues.

Another aspect of the research concerns the use of contemporary methods of sensing and measurement (optical - Bragg gratings – magnetic and piezoelectric sensors) for monitoring of structures emphasizing on the control of structural integrity by utilizing Neural Networks. The above have been applied to repaired specimens but also utilized in large structures (bridges, buildings etc).

Finally, another field of activities regards matters of education, with an emphasis in writing books in the topics of Mechanics of Material Finite Elements, Composite Materials and Constructions, Computational Fracture Mechanics, Boundary Element Method, Damage Tolerance Design, as well as matters of education itself.

RESEARCH AREAS:

I. Integral Equations for Solving Boundary Value Problems

Construction singular and hyper-singular integral equations for the solution of general or specific problems (half-plane, strip, circle with cracks, holes or notches) elasticity, elastoplasticity, piezoelasticity, wear and fatigue, solution of inverse problems.

II. Analytical Solution for Boundary Value Problems

The wedge problem, piezoelectric materials, Coupled fields, micro structural materials, Optimization of structures, bi-orthogonallity conditions.

III. Boundary Element Method. Numerical Methods for Singular or Hyper-Singular Integrals and Integral Equation. Error estimation- Convergence

Numerical methods of integration, convergence of integration methods, inversion of Mellin transform, numerical solution of integral and integral-differential equations, Convergence of numerical methods for solving integral equations.

IV. Path Independent Integrals

Construction of infinite new PIIs, for isotropic and anisotropic elastic materials.

V. Finite Element Method

(Special elements, mesh optimization, Combination of finite elements and integral equations, Special Finite elements etc)

VI. Finite Volume -Finite Difference Methods

Development of method for finite volumes regarding dynamic problems, microstructural materials, Resin Transfer Molding (RTM) containing woven carbon fibers or glass fibers, cracks etc

VII. A*dvanced* topics on FEM, FV and BEM

Adaptive techniques for FEM and boundary elements, mixed FEM, FV, discontinuous Galerkin, Error evaluation for FE, Meshless, Element Free FEM.

VIII. Composite Materials, Repairs.

Composite patch repair, delamination-crack propagation, SIF raisers

IX. Structural Health Monitoring

Smart Structures, Smart repairs, Optical Fibers, piezoelectric and magnetic sensors, neural networks, genetic algorithms.

X. Study of Problems regarding Microstructural and Piezoelectric Materials, Coupled Fields and Biomechanics

Solution of problems with piezoelectric and microstructural materials (gradient or nonlocal elasticity), nanotubes,thermoelasticity, plastic surgery and orthopaedics using BEM, FEM and mixed finite elements.

XI. Wear and Fatigue

Numerical Models for Fatigue and Wear

XII. Educational topics – E-learning

Handbooks in the field of Finite Elements, Mechanics of Materials, Composite materials and structures, Computational fracture mechanics, Damage Tolerance Design, Boundary Elements, Computational Elastodynamics, as well as publications and literature strictly in the field of education and E-learning

RESEARCH EXPERIENCE

Supervisor in 14 qualified theses

Total number of publications: 193

A) In international Journals with system of peer review: 105

B) In international books: 2

C) In conferences proceedings with system of peer review: 88

Teaching Books: 16

SELECTED PUBLICATIONS:

1. G. TSAMASPHYROS & P.S. THEOCARIS "On the Solution of the Sector Problem", *Journal of Elasticity*, Vol. **9**, pp.271-281, 1979.

2. G.J. TSAMASPHYROS & P.S. THEOCARIS "A New Concept of Path-Independent Integrals for Plane Elasticity", *Journal of Elasticity*, Vol. **12**, pp.265-280, 1982.

3. P.S. THEOCARIS, G. TSAMASPHYROS & E. THEOTOKOGLOU "A Combined Integral Equation and Finite-Element Method for the Evaluation of

Stress Intensity Factors", *Computer Methods in Applied Mechanics and Engineering*, 31, pp. 117-127, 1982.

4. G.TSAMASPHYROS & P.S. THEOCARIS "Integral-Equation Solution for Half Planes Bonded Together or in Contact and Containing Internal Cracks or Holes", *Ingenieur Archiv*, 53, pp. 225-241, 1983.

5. G. TSAMASPHYROS & G. DIMOU, "A Gauss Quadrature Formula for Cauchy Type Integrals", *Computational Mechanics*, 4, pp. 137-148, 1989.

6. G.TSAMASPHYROS & P.S. THEOCARIS "Equivalence and Convergence of Direct and Indirect Methods for the Numerical Solution of Singular Integral Equations", *Computing*, Vol. **27**, pp. 71-80, 1981.

7. G.TSAMASPHYROS & P.S.THEOCARIS, "On the convergence of some quadrature rules for Cauchy principal – value and finite – part integrals", *Computing*, **31**, pp. 105 – 114, 1983.

8. P.S. THEOCARIS & G. TSAMASPHYROS "A Numerical Solution of Singular Integrodifferential Equations with Variable Coefficients", *Applied Mathematics and Computation*, 15, pp.47-59, 1984.

9. G. TSAMASPHYROS & A.E. GIANNAKOPOULOS "The Mapped Elements for the Solution of Cracked Bodies", *Computer Methods in Applied Mechanics and Engineering*, 49, pp.331-342, 1985.

10. G. TSAMASPHYROS & E.N. THEOTOKOGLOU "Integral Equation Solution of the Infinite Strip with Cracks and Holes", *Mechanics Research Communications*, 13, pp. 133-149, 1986.

11. G.J.TSAMASPHYROS "Methods for Combination of Finite Element and Singular Integral Equation Methods", *Computer Methods in Applied Mechanics and Engineering*, 60, pp.45-56, 1987.

12. G.TSAMASPHYROS, "Singular element construction using mapping technique", *International Journal for Numerical Methods in Engineering*, **24**, pp. 1305 – 1316, 1987.

13. G.J. TSAMASPHYROS & E.N. THEOTOKOGLOU, "Uncoupled Superposition of Finite Element and Integral Equation Methods for the Solution of Crack Problems", *Int.J.Fracture Mech.*, **36**, pp.219-231, 1988.

14. G.TSAMASPHYROS & G.DIMOU, "Gauss quadrature rules for finite part integrals", *International Journal for Numerical Methods in Engineering* , **30**, pp. 13 – 26, 1990.

15. A.C. CHRYSAKIS & G. TSAMASPHYROS "Numerical solution of integral equations with a logarithmic kernel by the method of arbitrary collocation points" *International Journal for Numerical Methods in Engineering*, Vol.33, No1, pp143-148, 1992.

16. G. TSAMASPHYROS "Numerical Methods for Fracture Parameters Calculation", in "*Handbook of Fatigue Crack Propagation in Metallic Structures*", Andrea Carpinteri Editor, Vol. 1, pp. 107-147, Elsevier, 1994.

17. A.E.GIANNAKOPOULOS, K.F.NILSSON & G.TSAMASPHYROS, "The contact problem in delamination" *Journal of applied mechanics*, **62**, pp. 989 – 996, 1995.

18. G.J.TSAMASPHYROS, G.N.KANDERAKIS, N.K.FURNARAKIS, "Selection of optical fiber paths and sensor locations for monitoring the integrity of composite patching", *Applied compos. materials*, **10 (6)**, pp. 331 – 338, November 2003.

19. G.TSAMASPHYROS & S.MARKOLEFAS, "An estimate of the Babuska – Brezzi inf – sup discrete stability constant for general linear Petrov – Galerkin finite element formulations (an estimate of the Babuska – Brezzi stability constant), *Applied Mathematic Computing*, **144 (1)**, pp. 107 – 116, Nov 20, 2003.

20. E.ASTRINIDIS, RT.FENNER, G.TSAMASHYROS, "Elastoplastic analysis with adaptive boundary element method", *Computational Mechanics*, **33 (3)**, pp. 186 – 193, Feb.2004.

21. G.TSAMASPHYROS & S.MARKOLEFAS, "Some a priori error estimates with respect to H – theta norms, 0 < theta < 1, for the h – extension of the finite element method in tow dimensions", *Applied Numerical Mathematics*, **52 (4)**, pp. 449 – 458, March 2005.

22. G.J. TSAMASPHYROS AND S. P. FILOPOULOS, "Solution of plane strain problems for electroelastic media with curvilinear cracks, using complex potentials and singular integral equations. Part I: Theoretical analysis", *Proceedings of the ICCES conference*, Chennai, India December 1 – 10, 2005

23. G. TSAMASPHYROS and Z.F. SONG, 'Analysis of a crack in a finite thermopiezoelectric plate under heat flux', *International Journal of Fracture* Vol. **136**, pp 143–166, 2005.

24. TSAMASPHYROS G, THEOTOKOGLOU EE "A quadrature formula for integrals with nearby singularities" *International Journal for Numerical Methods in Engineering* Vol. **67** (8), pp1082-1093, AUG 20 2006. http://onlinelibrary.wiley.com/doi/10.1002/nme.1649/abstract;jsessionid=6BC0483C15689DBEE7BD8D41431D36D0.d02t02

25. G. TSAMASPHYROS, Z.F. SONG, 'The general solution for a finite thermopiezoelectric plate containing a hole and a crack', *Arch Appl Mech* Vol. **76**, pp 1–17, 2006.

26. THEOTOKOGLOU EE, TSAMASPHYROS G "A modified Gauss quadrature formula with special integration points for evaluation of Quasi-singular integrals" *Eng Anal Bound Elem* Vol. **30** (9), pp 758-766, SEP 2006. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V2N-

4KDBM12-1&_user=9614518&_coverDate=09/30/2006&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_acct=C000059671&_version=1&_urlVersion=0&_userid=9614518&md5=bfcd4126c02e17d477e7e08f9711a367&searchtype=a

27. G. J. TSAMASPHYROS, S. P. FILOPOULOS, 'Numerical Quadrature Formulae for Certain Types of Hadamard Finite-Part Integrals where the Singularity May Coincide with an Integration Node', *Proceedings of the International Symposium on Trends in Applications of Mathematics to Mechanics, STAMM 2006*, July 10 – 14, 2006, Vienna, Austria, Vienna University of Technology

28. G. J. TSAMASPHYROS, S. P. FILOPOULOS, 'A Newton-Cotes type numerical quadrature formula for hyper-singular integrals with discontinuous densities, where the singularity may coincide with a grid point', *Proceedings of the First South-East European Conference on Computational Mechanics SEECCM-06, June 28-30, 2006, Kragujevac, Serbia and Montenegro,* University of Kragujevac

29. G.TSAMASPHYROS, C. VRETTOS "The finite Volume Method Applied on Static and Dynamic Elasticity Problems" *Journal of the Mechanical Behavior of Materials,* Vol. **17**, No.3, pp. 207-217, 2006.

30. MARKOLEFAS SI, TSOUVALAS DA, TSAMASPHYROS GI "Theoretical analysis of a class of mixed, C-0 continuity formulations for general dipolar Gradient Elasticity boundary value problems" *International Journal of Solids and Structures,* Vol. **44** (2), pp 546-572, JAN 15 2007. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VJS-4JWDY4B-2&_user=9614518&_coverDate=01/15/2007&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_acct=C000059671&_version=1&_urlVersion=0&_userid=9614518&md5=78a6b174f8d0b83a7bd012a1bf33b849&searchtype=a

31. G.I. TSAMASPHYROS, S. MARKOLEFAS AND D.A. TSOUVALAS "Convergence & Performance of the h- and p- extensions with mixed finite element C^0 continuity formulations, for tension & Buckling of a Gradient Elastic beam". *International Journal of Solids and Structures,* Vol.**44**, No14-15, pp 5056-5074, 2007.

32. G.TSAMASPHYROS, G. N. KANDERAKIS, C. VRETTOS. K. KALKANIS, "Numerical investigation of the optimum placement locations of optical Fiber Bragg Grating sensors for the health monitoring of bonded composite repairs", *Macromol.Symposia,* Vol. **247**, p 221-229, 2007.

33. MARKOLEFAS SI, TSOUVALAS DA, TSAMASPHYROS GI, "Some C^0 – continuous mixed formulations, with explicit satisfaction of the respective essential conditions, for general bipolar linear Gradient Elasticity boundary value problems and the associated energy theorems" *Accepted in International Journal of Solids and Structures, 2007.*

34. G. J. TSAMASPHYROS AND TH. K. PAPATHANASSIOU ."Finite element analysis of cracked plates with circular stress raisers used for s.i.f. reduction" *III European Conference on Computational Mechanics, Solids, Structures and Coupled Problems in Engineering*, C. A. Mota Soares et al. (eds) Lisbon, Portugal, 5-8 June 2006

35. G. J. TSAMASPHYROS AND TH. K. PAPATHANASSIOU ."Heat Transfer Analysis of Reinforcing Patch Bonding Processes". *First South-East European Conference on Computational Mechanics, SEECCM-06*, June 28-30, 2006, Kragujevac, Serbia and Montenegro, University of Kragujevac.

36. G. J. TSAMASPHYROS, S. P. FILOPOULOS, "Numerical Quadrature Formulae for Certain Types of Hadamard Finite-Part Integrals where the Singularity May Coincide with an Integration Node", *Proceedings of the International Symposium on Trends in Applications of Mathematics to Mechanics, STAMM 2006*, July 10 – 14, 2006, Vienna, Austria, Vienna University of Technology

37. G. J. TSAMASPHYROS, K. KALKANIS, TH. K. PAPATHANASSIOU AND C. VRETTOS "Finite Element Analysis of Composite Patch Repaired Plates with Circular Stress Raisers used for S.I.F. reduction" *15th UK Conference of the Association of Computational Mechanics in Engineering*, B. H. V. Topping, (Editor), 2007.

38. G. J. TSAMASPHYROS, S. P. FILOPOULOS, "Numerical Quadrature Formulae for Certain Types of Hadamard Finite-Part Integrals where the Singularity May Coincide with an Integration Node. Part II: Local continuoys quadratic interpolation", *Proceedings of 8th HSTAM International Congress on Mechanics*, Patra, 2007

39. G. TSAMASPHYROS, C.D. VRETTOS "An alternative finite element / control volume formulation for the isothermal simulation of the RTM process", *Sent for publication.*

ALL PUBLICATIONS

A. Articles in Intenational Journals and Books

1. A. SAVAIDIS, G. TSAMASPHYROS, G. SAVAIDIS, M.VORMWALD "Mode I fatigue crack growth evaluation at notches", *Submitted for publication.*

2. G. TSAMASPHYROS, C.D. VRETTOS "An alternative finite element / control volume formulation for the isothermal simulation of the RTM process", *Submitted for publication*.

3. PAPATHANASSIOU, T.K., FILOPOULOS, S.P., TSAMASPHYROS, G.J., "Optimization of composite patch repair processes with the use of genetic algorithms"

Optimization and Engineering pp. 1-10, DOI: 10.1007/s11081-010-9116-0,Article in Press, 2010. http://www.springerlink.com/content/16250247585q8864/

4. TSAMASPHYROS, G.I., VRETTOS, C.D., "A mixed finite volume formulation for the solution of gradient elasticity problems" Archive of Applied Mechanics 80 (6), pp. 609-627, 2010. http://www.springerlink.com/content/44um3x70x52671l4/

5. TSAMASPHYROS, G.J., BIKAKIS, G.S., "Analytical modeling of circular GLARE laminated plates under lateral indentation" Advanced Composites Letters 18 (1), pp. 11-19, 2009. http://www.scopus.com/record/display.url?eid=2-s2.0-71549121646&origin=resultslist&sort=plf-t&src=s&st1=Tsamasphyros&nlo=&nlr=&nls=&sid=ku9C6be4WyKLEeeZSy5Hgsg:30&sot=b&sdt=b&sl=25&s=AUTHOR-NAME(Tsamasphyros)&relpos=97&relpos=17

6. FILOPOULOS, S.P., PAPATHANASIOU, T.K., MARKOLEFAS, S.I., TSAMASPHYROS, G.J., "Dynamic finite element analysis of a gradient elastic bar with micro-inertia" COMPUTATIONAL MECHANICS Volume 45, Number 4, 311-319, 2009. http://www.springerlink.com/content/v3747218107427p5/

7. TSAMASPHYROS, G., KALKANIS, K., KANDERAKIS, G., PANTELELIS, N., TUR, M., BOTSEV, Y., GORBATOV, N., (...), FISCHER, F., "Combined application of Bragg gratings and dielectric sensors for the cure monitoring of bonded composite repairs" Proceedings of SPIE - The International Society for Optical Engineering 7503, art. no. 75033H, 2009. http://spiedl.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=PSISDG007503000000175033H000001&idtype=cvips&gifs=yes&ref=no

8. G.J. Tsamasphyros, G.S. Bikakis, "Analytical modeling of circular GLARE laminated plates under lateral indentation", Advanced Composites Letters, 18 (1), 11-19, 2009.

9. G.J. Tsamasphyros, G.S. Bikakis, "Finite element modeling and analytical simulation of circular GLARE fiber-metal laminates subjected to lateral indentation", Journal of the Serbian Society for Computational Mechanics, 3 (2), 67-80, 2009.

10. TSAMASPHYROS, G., KALKANIS, K., MAROULAS, P., ANTHOULIS, G.I., GRIGORYEVA, O. "Formulation and evaluation af a novel adhesive film for use in composite patch repair" Macromolecular Symposia 286 (1), pp. 42-48, 2009. http://onlinelibrary.wiley.com/doi/10.1002/masy.200951205/abstract

11. FILOPOULOS, S.P., PAPATHANASSIOU, T.K., TSAMASPHYROS, G.J., "A finite element model for calculating the stresses in bars with microstructure loaded by ultra-short laser pulses" Journal of Thermal Stresses 32 (9), pp. 905-922, 2009. http://www.informaworld.com/smpp/1840889841-55954946/content~db=all?content=10.1080/01495730903102533

12. MARKOLEFAS, S.I., TSOUVALAS, D.A., TSAMASPHYROS, G.I., "Mixed finite element formulation for the general anti-plane shear problem, including mode III crack computations, in the framework of dipolar linear gradient elasticity" Computational Mechanics 43 (6), pp. 715-730, 2009. http://www.springerlink.com/content/h01kv465j4306219/

13. TSAMASPHYROS, G.J., PAPATHANASSIOU, TH.K., MARKOLEFAS, S.I., "Some analytical solutions of the Kamal equation for isothermal curing with applications to composite patch repair" Journal of Engineering Materials and Technology, Transactions of the ASME 131 (1), pp. 0110081-0110087, 2009. http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=JEMTA8000131000001011008000001&idtype=cvips&gifs=yes

14. TSAMASPHYROS, G., CHRISTOPOULOS, A., KANDERAKIS, G., KALKANIS, K., CHEMAMA, R., "Structural health monitoring of bonded composite repairs using embedded metallic grid - Numerical simulation" Proceedings of the 4th European Workshop on Structural Health Monitoring , pp. 515-523, 2008. http://www.scopus.com/record/display.url?eid=2-s2.0-62949185033&origin=resultslist&sort=plf-t&src=s&st1=Tsamasphyros&nlo=&nlr=&nls=&sid=ku9C6be4WyKLEeeZSy5Hgsg:30&sot=b&sdt=b&sl=25&s=AUTHOR-NAME(Tsamasphyros)&relpos=90&relpos=10

15. TSAMASPHYROS, G., KALKANIS, K., MAROULAS, P., ANTHOULIS, G.I., GRIGORYEVA, O., "Formulation and evaluation of a novel adhesive film for use in composite patch repair" AIP Conference Proceedings 1042, pp. 35-37, 2008. http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=APCPCS001042000001000035000001&idtype=cvips&gifs=yes&ref=no

16. TSAMASPHYROS, G., THEOTOKOGLOU, E.E., "Inmost singularities of S.I.Es influencing their numerical solution in the BEM" Engineering Analysis with Boundary Elements 32 (3), pp. 187-195, 2008. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V2N-4PYMWN5-1&_user=9614518&_coverDate=03/31/2008&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_acct=C000059671&_version=1&_urlVersion=0&_userid=9614518&md5=abd3b6b1a2c1570808f9baf80d86fb08&searchtype=a

17. THEOTOKOGLOU, E.E., TSAMASPHYROS, G., "Inmost singularities and appropriate quadrature rules in the boundary element method" WIT Transactions on Modelling and Simulation 44, pp. 141-148, 2007. http://library.witpress.com/pages/paperinfo.asp?PaperID=17642

18. PANDERMARAKIS, Z.G., SPATHIS, G., TSAMASPHYROS, G., "Constructing a modulus map for linear elastic composites: The case of rigid reinforcements" Polymer

Composites 28 (5), pp. 593-604, 2007. http://onlinelibrary.wiley.com/doi/10.1002/pc.20271/abstract

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20. G.TSAMASPHYROS, G. N. KANDERAKIS, C. VRETTOS. K. KALKANIS, "Numerical investigation of the optimum placement locations of optical Fiber Bragg Grating sensors for the health monitoring of bonded composite repairs", Macromol.Symposia, Vol. 247, p 221-229, 2007. http://onlinelibrary.wiley.com/doi/10.1002/masy.200750125/abstract

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27. G. TSAMASPHYROS and Z.F. SONG, 'Analysis of a crack in a finite thermopiezoelectric plate under heat flux', International Journal of Fracture Vol. 136, pp 143–166, 2005. http://www.springerlink.com/content/t47666kw57112261/

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