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# Applied Numerical Mathematics

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## Editorial

## Preface [Special issue: NumAn 2014]



### Introduction

The “Sixth International Conference on Numerical Analysis (NumAn 2014) – *Recent Approaches to Numerical Analysis: Theory, Methods and Applications*” was held during September 2–5, 2014, in Chania, Crete, Greece. Information regarding this event can be found at the webpage<sup>1</sup> of the conference hosted at the Technical University of Crete.

This conference was held to *honor the memory of Professor Emeritus Theodore S. Papatheodorou*. Theodore S. Papatheodorou, a prominent faculty member of the Department of Computer Engineering and Informatics at the University of Patras, Patras, Greece, passed away on December 10, 2012. Theo, as we all called him, was an internationally renowned educator and researcher. He was a leading and recognized expert in Numerical Analysis.

He was born in Patras, Greece in 1945 and graduated with honors from the University of Athens with a B.Sc. degree in Mathematics in 1968. He entered the graduate program at Purdue University in 1969, and subsequently earned his M.Sc. in Applied Mathematics and in Civil Engineering, and Ph.D. in Science in 1971, 1975 and 1973, respectively under the guidance of Professor Robert Lynch. He joined Clarkson University in 1976 and served there until 1984 when he was invited to join the newly formed Greek Ministry of Research and Development as scientific advisor. The Computer Technology Institute was established due to his efforts and he served as its first Director until 1990. His numerous accomplishments over the years contributed immensely to building the reputation of the Institute as a leader in Computing research. Meanwhile he joined the faculty of the Department of Computer Engineering and Informatics at the University of Patras where he established the High Performance Information Systems Lab (HPCLab) and also served as Dean, Head, member of the University Senate, Director of graduate studies, among other positions.

His research contributions covered various aspects of Computational Science and Computer Engineering. Seminal contributions include research and development work on system and application software for parallel and distributed computing, scientific computing, web and multimedia applications, 3D virtual reconstruction of monuments and other applications for culture and education, while, at the early years, his contribution in the development of a general methodology for generating arbitrary high order finite difference methods has influenced the invention of the so called HODIE methods and contributed significantly fast methods that became part of ACM algorithms and ELLPACK libraries. He published over 150 papers, including a book and he supervised and guided the doctoral work of fifteen students. Theo was member of many international scientific committees and was awarded several prizes and awards.

Theo taught a wide range of courses during his entire academic career. He was a gifted teacher with selfless service and with keen interest for his students. He influenced with his academic presence the lives of a great number of students and colleagues.

Theodore S. Papatheodorou will be remembered as a *gentleman*, a *scholar* and an *unassuming researcher*.

NumAn 2014 is the sixth conference in the series of NumAn conferences. The First NumAn Conference was held in 2005 in Ioannina, Greece. The next two Conferences were held in 2007 and 2008 in Kalamata, Greece (see [3]<sup>2</sup> and [2]<sup>3</sup>), the Fourth NumAn Conference was held in 2010 in Chania, Greece (see [1]<sup>4</sup>), while the Fifth NumAn Conference was held in 2012 in Ioannina, Greece (see [4]<sup>5</sup>).

The NumAn 2014 Conference was honored to host six Plenary Speakers:

(1) Athanassios S. Fokas (Academy of Athens, Greece and University of Cambridge, United Kingdom),

<sup>1</sup> <http://numan2014.amcl.tuc.gr/>.

<sup>2</sup> <http://www.math.upatras.gr/numan2007/>.

<sup>3</sup> <http://www.math.upatras.gr/numan2008/>.

<sup>4</sup> <http://numan2010.science.tuc.gr/>.

<sup>5</sup> <http://users.uoi.gr/numan2012/>.

- (2) Arie Iserles (University of Cambridge, United Kingdom),
- (3) Zhong-Zhi Bai (Chinese Academy of Sciences, China),
- (4) Elias N. Houstis (University of Thessaly, Greece and Purdue University, USA),
- (5) Michael N. Vrahatis (University of Patras, Greece), and
- (6) Dimitrios Noutsos (University of Ioannina, Greece).

The aims of the Conference were:

- (1) to bring together and bequeath scientific activities, directions and pursuits of scientists in Greece and abroad on subjects that pertain to the Conference,
- (2) to foster an exchange of views and ideas,
- (3) to study the theoretical background required for methods, algorithms and techniques used in applications,
- (4) to search directions of theoretical results towards applications,
- (5) to highlight open problems and future directions of numerical analysis.

The members of the Conference Organizing Committee were: G.D. Akrivis, V.A. Dougalis, E. Gallopoulos, A. Hadjidimos, I.S. Kotsireas, C.G. Makridakis and Y.G. Saridakis. The members of the Local Organizing Committee of the Conference were: A.I. Delis, E.N. Mathioudakis, E.P. Papadopoulou, Y.G. Saridakis while the members of the Local Committee of the Conference were: I. Athanasakis, V. Mandikas, M. Papadomanolaki, A. Sifalakis, N. Spanoudakis, P. Stratis, N. Vilanakis. Significant help in the organization was also kindly provided by Professor Spyridon Likothanassis.

The approximately 140 participants came from 30 countries: Australia, Austria, Bulgaria, Canada, China, Cyprus, Czech Republic, France, Greece, Japan, Israel, Italy, Korea, Lebanon, Maroc, Mexico, Netherlands, Nigeria, Poland, Portugal, Russia, Saudi Arabia, South Africa, Spain, Switzerland, Thailand, Tunisia, Turkey, United Kingdom and the United States.

At the conference were presented 6 plenary talks, 97 contributed talks and 10 posters. The issue at hand of Applied Numerical Mathematics contains papers selected after formal review from NumAn 2014 Conference. Due to this year's special commemoration, the conference offered the **T.S. Papatheodorou Young Researcher Awards** to the authors of selected papers presented at the conference.

### Synopsis of the NumAn 2014 conference activities

*Tuesday, September 2nd, 2014*

*Opening ceremony:* The president of the Organizing Committee of the Conference, Professor Yiannis G. Saridakis of the Technical University of Crete addressed the attendants and declared, on behalf of the Organizing Committee, the opening of the conference.

The keynote speakers and their corresponding lectures were as follows:

- (1) Elias Houstis: *Remembering Theo Papatheodorou.*
- (2) Athanasios S. Fokas: *The interplay of the concrete and general: From PDEs to medical imaging.*

The plenary talks were followed by the presentation of 31 submitted papers organized in 3 time periods each of which consisted of two parallel sessions. Three periods were devoted to the organization of the following Workshops:

- (1) *Analytical and numerical aspects of the Fokas transform method*, organized by Yiannis G. Saridakis of Technical University of Crete and supported by European Union (European Social Fund ESF) and Greek national funds through the Operational Program Education and Lifelong Learning of the National Strategic Reference Framework (NSRF) – Research Funding Program: THALES.
- (2) *Analytical methods for medical imaging and their numerical implementation*, organized by George Kastis, Academy of Athens Research Center of Pure and Applied Mathematics.

*Wednesday, September 3rd, 2014*

The keynote speakers and their corresponding lectures were as follows:

- (1) Dimitrios Noutsos: *Perron–Frobenius theory – some extensions and applications.*
- (2) Zhong-Zhi Bai: *Scalable and fast iteration methods for complex linear systems.*

The plenary talks were followed by the presentation of 32 submitted papers organized in 3 time periods each of which consisted of two parallel sessions. Four periods were devoted to the organization of the following Workshops:

- (1) *Mathematical modeling of complex systems: the computational approach*, organized by Tassos Bountis of the University of Patras.
- (2) *Numerical methods and software platform for solving multi-physics, multi-domain problems on modern computer architectures*, organized by Manolis Vavalis of the University of Thessaly.

Both workshops were supported by European Union (European Social Fund ESF) and Greek national funds through the Operational Program Education and Lifelong Learning of the National Strategic Reference Framework (NSRF) – Research Funding Program: THALES.

Thursday, September 4th, 2014

The keynote speakers and their corresponding lectures were as follows:

- (1) Michael N. Vrahatis: *Sign methods for imprecise problems.*
- (2) Arieh Iserles: *Fast computation of the semiclassical Schrödinger equation.*

The plenary talks were followed by the presentation of 20 submitted papers and 10 posters organized in 3 time periods each of which consisted of two parallel sessions. One period was devoted to the organization of the following Workshop:

- *Numerical Wave Breaking: formulation, validation and practical implementation of wave breaking in Boussinesq-type models for non-hydrostatic free surface modeling*, organized by Argiris I. Delis of Technical University of Crete and Mario Ricchiuto of INRIA Bordeaux, France.

The talks were followed by a guided tour at the Archaeological Museum and the several city areas (Kydonia Ruins, Venetian Harbour, Old City District) of historical interest. All participants were also attended the conference dinner at a scenic Greek Fish Tavern located in the north-east corner of the Venetian Harbour.

Friday, September 5th, 2014

The last day of the conference included the presentation of 14 submitted papers in two time periods. The last session of the conference was a long Panel Discussion coordinated by Professors Apostolos Hadjidimos and Efstratios Gallopoulos. All participants available that day attended and many of them spoke. The Panel signaled the end of the NumAn 2014. Warm thanks were extended from everyone present as the organizers promised to see that NumAn Conferences continue in the future.

## Acknowledgements

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We are extremely grateful as organizers and journal guest editors and extend our most sincere thanks to International Association for Mathematics and Computers in Simulation (IMACS) for sponsoring the NumAn 2014 conference through providing us the edition of a Special Issue of the IMACS journal “Applied Numerical Mathematics”.

Last but not least, we would like to express our cordial thanks to Professor Robert Beauwens, Editor-in-Chief of Applied Numerical Mathematics (APNUM) Journal, who accepted our proposal to host in a Special Issue of the APNUM Journal selected papers presented at the NumAn 2014 Conference, as well as to Ms. France Pinon, Editorial Office Manager. Without their patience and continuous encouragement and assistance this Special Issue would not be possible. Many thanks go also to the Elsevier B.V. Publishers.

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