

## INTRODUCING THERMOCON 2016

DAVID JOU <sup>a</sup>, LILIANA RESTUCCIA <sup>b\*</sup> AND PETER VÁN <sup>c</sup>  
(Guest Editors)

ABSTRACT. Preface to the AAPP supplementary issue collecting the proceedings of the international conference on “Thermal theories of continua: Survey and developments” (19-22 April 2016; Messina, Italy).

This special issue brings together the communications presented at the international conference entitled “Thermal theories of continua: Survey and developments (Thermocon 2016)”, which was held in Messina on 19-22 April 2016 in honour of Prof. Wolfgang Muschik and Prof. Vincenzo Ciancio, eminent scientists and very appreciated teachers, on the occasion of their 80th and 70th birthdays, respectively.<sup>1</sup>

The conference was a joint initiative of the “Department of Mathematical, Computer, Physical and Earth Sciences” of the University of Messina and of the *Accademia Peloritana dei Pericolanti*, a scientific society active in Messina since 1729. The focus of the conference was on recent developments and new ideas in thermal theories and their applications to materials science and to complex systems. Thus, in contrast with the idea that macroscopic theories and thermodynamic developments are not useful beyond the range of equilibrium and local-equilibrium situations, the two Thermocon conferences held in Messina in 2005 and 2016 aimed to show that these topics are alive and creative as a response to new challenges set by technology and by new surprising discoveries in fundamental science.

From the point of view of their contents the papers in this issue can be grouped in three areas: *heat transfer*, *materials science* and *foundations of thermodynamics*. Besides being deeply interconnected, a common current aspect in these fields is their interest in formulating theories at a mesoscopic level, *i.e.*, more detailed than the macroscopic level of classical thermodynamics, but not so detailed as the purely microscopic descriptions. From the conceptual point of view, the formulation of the mesoscopic theories has two main challenges in the frontiers between microscopic and macroscopic descriptions, namely: how the time reversibility at microscopic levels becomes irreversibility at mesoscopic and

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<sup>1</sup>Their *curriculum vitae* are included as appendices to this preface.

macroscopic levels, and how the quantum description at microscopic levels becomes a classical description at mesoscopic and macroscopic levels. From the practical point of view, mesoscopic descriptions are of much interest in engineering because they provide much simpler equations than the microscopic ones, but much more accurate than the macroscopic ones.

*Heat transfer* is, apparently, a very classical part of physics, as well as equilibrium thermodynamics. However, the impetus of nanotechnology has brought many new challenges and perspectives, because the classical transport equations, valid for situations in which the mean free path is much smaller than the characteristic size of the system, fail for nanosystems, whose characteristic size is of the order, or smaller, than the mean free path of heat carriers. From the continuum perspective, a relevant problem is to find new transport equations wider than the classical ones, successful in a description of transport in nanosystems as well as in the classical situations; this asks for an overarching effort containing also the intermediate size ranges.

*Materials science* has always relied important aspects on thermodynamics, and in particular in phase transitions and phase diagrams. Also, in this perspective, the number of new open topics is impressive: magnetic systems, materials for energy management, light emission and photovoltaic processing, thermoelectric energy processing, electric batteries, metamaterials designed to optimize specific functions, biomaterials. All these topics constitute an extremely active and multifaceted area, in which thermodynamics and transport theory play an important role. Such new materials base a part of their interesting properties on the control of their microstructure, at microscale and nanoscale.

*Foundations of thermodynamics* are the third main aspect in the meeting. Indeed, the new avenues open in transport theories and in materials science provide strong stimulus to try to bring thermodynamics to areas wider than the classical ones, including some extreme situations far from equilibrium (fast phenomena, steady states with strong fluxes) or regarding the size of the system (small systems, microstructured and nanostructured systems, and systems with long-range correlations, as for instance systems with quantum entanglements). In particular, the connection of thermodynamics, generalized transport equations and generalized equations of state, with the corresponding implications on stability and phase transitions, is a source of new inspiring challenges in these areas.

We will briefly mention the contributions presented to the meeting in these three main areas. Of course, it is only an indicative presentation, because in fact many papers could be classified in two or three of the mentioned areas, *i.e.*, some papers are of interest both in heat transport and in foundations of thermodynamics, or in materials science and foundations of thermodynamics, and so on. However, in order to simplify the presentation we have attributed to them only one area. As the reader will see, the presentations are rather miscellaneous, instead of being focalized in a very specific area, because Thermocon meetings aim to foster the dialog of specialists working on different problems. This is logical, as one of the most attractive features of thermodynamics is its providing a bridge amongst many different particular problems, trying to underline their hidden common aspects.

In *transport theory* the topic of heat transport in nanosystems was considered from two main angles: theories with internal variables, allowing to incorporate the influence of internal microstructures of the system on the dynamics of heat and mass transport, and

extended thermodynamics, taking the relevant fluxes of the system as additional independent variables. Both theories may be mutually related if the fluxes are considered as internal variables of dynamical order. In particular, hidden vectorial variables are considered in two papers: description of interactions among heat conduction, diffusion phenomena, viscous flow and chemical reactions are considered by Ciancio and Palumbo (2019), and internal variables are used in connection with classical irreversible thermodynamics to derive a Guyer-Krumhansl equation for temperature, relevant in nanosystems (Ciancio and Restuccia 2019). A wide review of the use of extended irreversible thermodynamics, taking the heat flux as additional independent variable and searching evolution equations for it, to obtain the effective thermal conductivity of a number of nanostructures, mainly consisting of small particles or rods of several different geometries embedded in host media of different kinds is provided by Lebon and Machrafi (2019). Extended thermodynamics is also present in other three contributions to this volume: description of heat transfer in superfluid helium as applied to refrigeration of a simplified model of computer consisting of an array of heat-producing nanocylinders between two parallel plates (Jou *et al.* 2019), in thermal effects related to charge transport in graphene with high-field mobility on a substrate including the Pauli exclusion principle (Coco *et al.* 2019), and in hydrodynamic modelling of electron transport in semiconductor devices including heat dissipation in gated silicon nanowire transistors (Muscato *et al.* 2019).

In *materials science* one must consider the peculiar material properties of the state of the system (a topic which is especially complex because of the use of nonhomogeneous mixtures of different materials structured according to a diversity of natural and artificial microstructures), the thermodynamic equations of state allowing for the description of the several phases of the system, and the transport properties of the system, which depend strongly on the structure and the composition of the materials. The materials considered here are fluids (eight papers), solids (two papers) and living matter (one paper). Three of the papers on fluids are devoted to turbulent superfluids, with special attention to heat transport in laminar and in turbulent flows incorporating the quantized vortex formation near superfluid transition in Helium (Saluto *et al.* 2019), vortex diffusion with hysteresis and decay (Mongiovì *et al.* 2019), and superfluid turbulence and anisotropic turbulent vortex tangles (Mongiovì and Restuccia 2019). Other two papers are devoted to fluids with internal structure, namely, mesoscopic theories inspired in liquid crystals (Papenfuss 2019), and dipolar fluids with spin-flow coupling with attention to extended constitutive relations and boundary conditions (Hess 2019). Three papers are devoted to fluids showing viscoelasticity: a mathematical paper on existence results for viscoelastic singular kernels in viscoelasticity (Carillo 2019), and two papers dealing with nonlinear thermodiffusive stability problems: thermosolutal convection in a rotating Walters viscoelastic fluid (Palese 2019), and thermodiffusive equilibrium in magnetic Bénard problem (Labianca and Palese 2019). The two papers related with solid systems deal with an irreversible thermomechanics model of multiferroic systems (Maruszewski 2019), and two models of aging and fatigue in viscoelastic solids (Fabrizio *et al.* 2019). Eventually, one paper deals with a biophysical problem: biophysical macromolecular systems with microscopic stretching analyzed by means of infrared spectroscopy (Caccamo and Magazù 2019).

In the *foundations of thermodynamics* the nine contributions deal with several different aspects, including basic concepts as entropy, temperature, spatial and temporal transformations, and stability and availability problems. Three of the papers deal with several aspects of entropy and temperature in nonequilibrium situations: steepest entropy concepts and techniques as applied to far from equilibrium systems with new definitions of entropy and temperature which are not based on the concepts of heat and thermal reservoir (Beretta and Zanchini 2019); the role of nonequilibrium temperatures arising in extended thermodynamics and in systems with internal variables in connection with heat transport, particularized to systems with dislocations (Jou and Restuccia 2019) and in systems with multiscale dynamics and thermodynamics (Grmela and Restuccia 2019). Three other papers are related to the role of spatial and temporal transformations in thermodynamics: the consequences of generalized Galilean transformations on tensors and cotensors with application to general fluid motions (Ván *et al.* 2019); the exploitation of a special-relativistic entropy identity for one-component in multi-component systems (Muschik 2019), and a more mathematical paper on polarized harmonic mappings and optimal moving frames as applied to systems of  $N$  point vortices in the plane (Preston and Thompson 2019). Other three papers were devoted to aspects of three thermodynamic current formalisms: an examination of the Braun-Le Chatelier stability principle in nonequilibrium dissipative thermodynamics of driven systems (Pavelka and Grmela 2019), quantum finite time availability of parametric oscillators as compared to classical finite-time availability (Hoffmann *et al.* 2019); and nonlinear extensions of non-equilibrium thermodynamics including sliding friction (Verhas 2018). These contributions provide a large overview of active currently topics and may be a stimulus for researches working on related problems in transport sciences, materials science and the foundations of thermodynamics.

A very dear and special memory goes to Prof. Bogdan T. Maruszewski, great and unforgettable friend and colleague, who passed away on 27 December 2017. Indeed, he should have been among the guest editors of this issue. We are profoundly grateful to him for his very precious advice and assistance in the organization of the conference and in the initial handling of submitted manuscripts for review.

We thank the sponsors of this conference: *Accademia Peloritana dei Pericolanti*, Messina (Italy); *Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra, Università degli Studi di Messina*, Messina (Italy); *Istituto Nazionale di Alta Matematica - Gruppo Nazionale per la Fisica Matematica* (Italy); *Departament de Física, Universitat Autònoma de Barcelona*, Bellaterra, Catalonia (Spain); *Institute of Applied Mechanics, Poznań University of Technology*, Poznań (Poland); *Institute of Theoretical Physics, Technical University of Berlin*, Berlin (Germany); *Hungarian Academy of Sciences, Wigner Research Centre for Physics, Institute of Particle and Nuclear Physics*, Budapest (Hungary); *Banco Popolare Siciliano*, Messina (Italy).

We are also grateful to Prof. Paolo V. Giaquinta, director of the Science Division of the *Accademia Peloritana dei Pericolanti* and editor of this journal, as well as to Dr. Giacomo Fiumara and Dr. Alessandra Jannelli for their pervasive involvement in the editing of the manuscripts and in the production of this special issue. Our last thanks go to Prof. Santi Scinelli for his great help in the preparation of this Conference, and to Dr. Maria Teresa Caccamo and PhD student Alessio Famà for their appreciated cooperation.

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## Appendix 1

### Proceedings of the International Conference on Thermal Theories of Continua: Survey and Developments THERMOCON2016

April 16-22, 2016

Università degli Studi di Messina  
Dipartimento di Scienze Matematiche e Informatiche,  
Scienze Fisiche e Scienze della Terra

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Participants in the conference on the staircase of the *Palazzo Rettorato* of the University of Messina.



**Appendix 2****Wolfgang Muschik***Curriculum Vitae*

Born in Berlin (Germany) on 10 October 1936.

**Professional employment**

- 1955 Final examination of secondary school,  
begin of studies of physics at the Technische Universität Berlin
- 1958 Fellow of the Studienstiftung des Deutschen Volkes
- 1962 Diplom in Theoretical Physics,  
subsidiary fields: Mathematics and Physical Chemistry,  
Position as an assistant at the chair III for Mathematics at the Technische  
Universität Berlin (Prof. Dr. K. Jaeckel)
- 1966 Thesis (Dr. rer. nat.) in the field of Irreversible Thermodynamics,  
First assistant at the chair II for Theoretical Physics at the Technische  
Universität Berlin (Prof. Dr. A. Haug)
- 1970 Habilitation at the Faculty of General Engineering Sciences,  
Professor for Theoretical Physics at the Department of Physics at the  
Technische Universität Berlin
- 1971 Member of the Committee for Teaching and Studies of the TU Berlin
- 1972 Call on a position of an Associated Professor at the Institute for Theoret-  
ical Physics at the University Düsseldorf (Prof. Dr. K. Suchy)

- 1975 Call on a position of a full professor for Mathematical Physics at the University Bremen  
At the same time, call on a position of a full professor for Technical Thermodynamics at the Technische Universität Berlin.  
Full professor for Theoretical Physics at the Department of Physics at the Technische Universität Berlin.
- 1976 Co-Editor of the *Journal of Non-Equilibrium Thermodynamics*, (till 2013)
- 1979 Member of the Committee for Teaching and Studies of the TU Berlin (till 1985)
- 1980 Chairman of the Committee for Teaching and Studies of the TU Berlin (till 1985)
- 1980 Stay at the Department of Engineering at the Brown University, Providence, R.I., USA (Prof. J. Kestin), 8 weeks
- 1981 Lecturer at the HSBw Munich, Germany (1 week compact course on Non-equilibrium Thermodynamics)
- 1982 Deputy Member of the Academic Senate of the TU Berlin (till 1984)
- 1984 Member of the Academic Senate of the TU Berlin (till 1995)
- 1985 Stay at the Jiao Tong University Shanghai,  
at the Beijing Institute of Technology,  
at the Zhejiang University in Hangzhou and  
at the Suzhou University in Suzhou  
(9 weeks lecturing)
- 1987 Member of the Center of Research on “Anisotropic Fluids” in the field of liquid crystals  
Sonderforschungsbereich 335 “Anisotrope Fluide”
- 1988 Stay at Micromechanics Research Laboratory at the Department of Mechanical Engineering, McGill University, Montreal, Canada, 4 weeks lecturing
- 1988 Director of the Institute for Theoretical Physics of the TU Berlin
- 1988 Member of the Committee for Sponsoring Foreign Partnerships of the TU Berlin
- 1993/5 Member of the European Thermodynamics Network in the frame of the EC Human Capital & Mobility Programme
- 1995 Research and lecturing stay at the Laboratoire de Modélisation en Mécanique, Université Pierre et Marie Curie, Paris VI (Prof. G.A. Maugin), 2 weeks
- 1996 Member of the Editorial Board of the *Journal of the Egyptian Mathematical Society*
- 1996/9 Responsible for scientific organization of the European Thermodynamics Network of the EC Human Capital & Mobility Programme
- 1997 Member of the Editorial Board of *ARI* An Interdisciplinary Journal of Physical and Engineering Sciences
- 1997 Corresponding Member of the *Accademia Peloritana dei Pericolanti* in Messina

- 1998 Member of the Editorial Board of *Archives of Thermodynamics*
- 2000 Chairman of the Committee for Sponsoring Foreign Partnerships of the TU Berlin
- 2001 Guestprofessorship at the Dipartimento di Matematica, Università di Messina (Prof. L. Restuccia); 10 Lectures on Concepts of Special and General Relativity Theory
- 2001 Guestprofessorship at the Institut für Polymere, ETH Zürich (Prof. H.C. Öttinger); research and lecturing (4 weeks)
- 2001 Lecturing stay at the Laboratoire de Modélisation en Mécanique (Prof. G. A. Maugin), Université Pierre et Marie Curie, Paris VI, 1 week
- 2002 Guestprofessorship at the Dipartimento di Matematica, Università di Messina (Prof. L. Restuccia): Concepts of Non-Equilibrium Thermodynamics; Continuum Theories of Liquid Crystals; Variational Principles of Thermodynamics (4 weeks)
- 2002 Lecturing stay at the Laboratoire de Modélisation en Mécanique (Prof. G.A. Maugin), Université Pierre et Marie Curie, Paris VI, 1 week
- 2003 Guestprofessorship at the Dipartimento di Matematica, Università di Messina (Prof. L. Restuccia); 12 Lectures on Concepts of Special and General Relativity Theory; Thermodynamics of Discrete Systems (2 weeks)
- 2004 Guestprofessorship at the Dipartimento di Matematica, Università di Messina (Prof. L. Restuccia); 12 Lectures on Observers and the Theories of Relativity (2 weeks)
- 2004 Stay at the University of Technology and Economics, Budapest, Hungary (1 week)
- 2005 March 31, Professor emeritus
- 2007 Guest Lecturer at the Institute of Applied Mechanics of the Poznań University of Technology and of the Polish Association of Theoretical and Applied Mechanics (Prof. B. Maruszewski), 1 week

### Fields of Research

- (1) Continuum Physics
- (2) Theory of Liquid Crystals
- (3) Theoretical Non-Equilibrium Thermodynamics
- (4) Relativistic Thermodynamics

### Teaching

- (1) Introduction to Theoretical Physics
- (2) Course Theoretical Physics:  
Mechanics, Quantum Mechanics, Electrodynamics, Thermodynamics and Statistics
- (3) Irreversible Thermodynamics
- (4) Continuum Physics
- (5) Statistical Physics
- (6) Relativity Theory
- (7) Super-Conductivity
- (8) Supplements to Quantum Mechanics

- (9) Phase Transitions
- (10) Axiomatic Thermodynamics

### **Co-Organized Meetings**

- 1987 February 23 - 24, Constitutive Laws and Microstructure, Wissenschaftskolleg zu Berlin
- 1988 February 8 - 9, Philosophie, Physik, Wissenschaftsgeschichte, Wissenschaftskolleg zu Berlin
- 1989 April 24 - 25, Philosophie, Physik, Wissenschaftsgeschichte, Wissenschaftskolleg zu Berlin
- 1990 June 20 -22, Relativitätstage Berlin - Jena, TU Berlin
- 1992 June 11 - 12, Nonlinear Thermodynamical Processes in Continua, Wissenschaftskolleg zu Berlin
- 1992 August 10 - 13, Statistical Physics and Thermodynamics of Nonlinear Nonequilibrium Systems, stat.phys 18 Satellite Meeting in Berlin
- 1992 September 28 - October 2, Non-Equilibrium Thermodynamics with Applications to Solids, International Centre for Mechanical Sciences, Udine
- 1994 September 5 - 7, Minisymposium on Variational Methods in Thermophysics, TU Berlin
- 1995 April 2 - 5, 1st Workshop on Dissipation in Physical Systems, Kielce
- 1995 May 11 - 13, Minisymposium on Thermodynamics of Surfaces, TU Berlin
- 1996 June 5 - 7, Models, Theories and Disunity in Physics, Wissenschaftskolleg zu Berlin
- 1996 July 5, Kolloquium über Objektivität und Materielle Indifferenz, TU Berlin
- 1997 September 1 - 3, 2nd Workshop on Dissipation in Physical Systems, Kielce
- 1997 November 13 - 15, Colloquium on Finite Time Thermodynamics, TU Berlin
- 1998 April 24 - 25, Minisymposium on Biaxiality of Liquid Crystals, TU Berlin
- 1998 August 17 - 20, International Symposium on Trends in Continuum Physics Trends '98, Poznań University of Technology, TU Berlin, Kielce University of Technology, in Poznań, Polska
- 1999 September 24, Minisymposium on Items of Continuum Physics, TU Berlin
- 2000 June 6 - 7, Minisymposium: Developments and Applications in Continuum Theory of Mechanics and Thermodynamics, V Congresso Nazionale della SIMAI, Società Italiana di Matematica Applicata e Industriale, Ischia Porto
- 2001 September 3 - 6, CIMRF 2001, Current Ideas in Mechanics, Thermodynamics, and Related Fields, TU Berlin
- 2002 March 5 - 8, Workshop: Material in Gravitationstheorien, TU Berlin

2003 July 20 - 25, Meeting ThermoSyst, Silberbach (Oberfranken, Germany)

2004 September 20 - 24, Minisymposium: On Different Applications of Recent Thermodynamical and Mechanical Theories, VII Congresso Nazionale della SIMAI, Società Italiana di Matematica Applicata e Industriale, Venezia, San Servolo

2004 The International Symposium on Trends in Continuum Physics, TRECOP'04, November 17 - 19, Poznań, Polska

2005 Summerschool and International Conference Thermal Theories of Continua Survey and Developments THERMOCON'05 Università degli Studi di Messina September 25 - 30, Messina, Sicilia, Italia

2007 Conference and Course on Continuum Physics and Engineering Applications, CEPEA'07 Budapest University of Technology and Economics June 2 - 11, Ráckeve, Hungary

2007 Proceedings of the International Symposium on Trends in Continuum Physics *TRECOP '07*, September 16 - 20, 2007, Lviv, Ukraina

2008 Minisymposium on “Recent Progress and applications in Thermodynamics”, VIII Italian Conference on Applied and Industrial Mathematics, SIMAI 2008, 15-19 May, Roma, Italy

2009 Naturwissenschaft und Weltbild Empirie versus Spekulation Triangel-Kolloquium der Guardini Stiftung 13. - 15. März 2009, Leucorea-Stiftung Wittenberg, Germany

2009 Naturwissenschaft und Weltbild II Zufall versus Notwendigkeit Triangel-Kolloquium der Guardini Stiftung 13. - 15. November 2009, Leucorea-Stiftung Wittenberg, Germany

2010 Minisymposium, on Recent Ideas in Non-Equilibrium Thermodynamics and Applications, X Italian Conf. on Applied and Industrial Mathematics, SIMAI 2010, 21- 25 June, Cagliari, Italy

2016 International Conference THERMOCON16 “Thermal Theories of Continua: Survey and Developments” , Messina, Italy, 19- 22 April, 2016

2017 Topics on Non-equilibrium thermodynamics of dissipative processes in complex media N.1 Session of Joint European Thermodynamics Conference (JETC 2017), Budapest, Hungary, 21-25 May, 2017

Prof. W. Muschik is the author of more than 220 publications.

### Appendix 3

## Vincenzo Ciancio

### *Curriculum Vitae*



Born in Messina (Italy) on 6 July 1946.

#### 1) Professional employment

- 1964 Final examination of secondary school: Scientific Liceum “G. Seguenza”, Messina and begin of studies of Mathematics at the University of Messina.
- 1968 (26.06.1968) Doctor in Mathematics (final score 110/110), with thesis in the field of Differential Geometry, supervisor Prof. Dr. Ugo Salini.
- 1969 Assistant at the chair for Mathematical Physics at Messina (Prof. Dr. Giovanni Carini.)
- 1972 Professor at the Faculty of Mathematics, Physics and Natural Sciences of Universities of Messina and Cosenza and at the Faculty of Engineering of University of Reggio Calabria. Member of Accademia Peloritana dei Pericolanti, University of Messina and of the National Group of Mathematical Physics (GNFM).
- 1980 Associated Professor of Rational Mechanics at the University of Messina.
- 1987 Full professor of Rational Mechanics at the University of Cosenza.
- 1990 Called as Full professor of Mathematical Physics at the University of Messina.

#### 2) Istitutional positions

- 1987-1990 Director of the Department of Mathematics and Member of the Board of Directors of University of Calabria (Cosenza).
- 1994-2004 President of the Degrees Course of Mathematics of University of Messina.
- 1995-1997 Member of the Board of Directors of University of Messina.

- 2000-2008 Member of the Board of Directors of Istituto Nazionale di Alta Matematica (INdAM), Roma.
- 2007-2013 Director of the Center of Computer Sciences (CECUM) University of Messina and Member of the Board of Directors of CINECA, Bologna.

### 3) Taught courses

- Rational Mechanics.
- Continuum Physics.
- Non-Equilibrium Thermodynamics in Continuous Media.
- Dynamic Systems.
- Rheological Media.
- Relativity Theory.
- Mathematical Analysis
- Differential Analysis.
- Operational Researches.
- Optimization Methods.
- Financial Mathematics.

### 4) Visiting positions

- 1978 September: Department of Mathematics University Technology of Eindhoven, Netherland.
- 1979 15th June - 31th July: Department of Mathematics University Technology of Eindhoven, Netherland.
- 1983 September: Department of Mathematics University Technology of Eindhoven, Netherland.
- 1986 September: Department of Mathematics University of Eindhoven, Netherland.
- 1988 1th-31th August: Department of Mathematics University Technology of Eindhoven, Netherland.

### 5) Organizational scientific activity

- 1988 Scientific responsible for the italian part of the Italy-Holland bilateral contract C.N.R. n. 88.00268.01
- 1989 Scientific responsible for the italian part of the Italy-Holland bilateral contract C.N.R. n. 89.01204.01
- 1990 Scientific responsible for the italian part of the Italy-Holland bilateral contract C.N.R. n. 90.01118.CT01
- 1994 Scientific responsible for the italian part of the Italy-Hungary bilateral contract C.N.R. n. 94.00268.01
- 1995 Scientific responsible for the italian part of the Italy-Hungary bilateral contract C.N.R. n. 95.01084.CT01
- 1996 Scientific responsible of the contract C.N.R. n. 96.00268.01: “*Physical modeling of the geodynamic processes of southern Italy with particular reference to the study of stress-strain relations*”.

- 1997 Scientific responsible of the contract C.N.R. n. 97.00110: “*Origin and phenomenology of earthquakes*”.
- 1999 “Wascom 99”, 10th Conference on Waves and Stability in Continuous Media, Vulcano (Eolie Islands), Italy, 7-12 June 1999.
- 2003 Scientific local responsible (University of Messina) of the National Research Programs (PRIN-2003) “*Conservation laws and thermodynamics in continuum mechanics and in field theories*” (scientific national responsible, Prof. Mauro Francaviglia, University of Torino).
- 2005 Scientific local responsible (University of Messina) of the National Research Programs (PRIN-2005) “*Unconventional thermodynamic models for complex vehicles*” (scientific national responsible, Prof. Marco Ferraris, University of Torino).
- 2005 Summer school and International Conference “Thermocon ’05”, Thermal Theories of Continua: Survey and Developments, University of Messina, Italy, 25-30 September 2005.
- 2005 Scientific responsible (University of Messina) of the Ordinary Research Programs (PRA-2005) “*Thermodynamics of non-equilibrium. Evolutionary models in continuous media*”.
- 2006-09 Scientific responsible (University of Messina) of the Ordinary Research Programs (PRA-2006/2007 and PRA 2008/2009) “*Thermodynamic models for complex media*”.
- 2016 International Conference “Thermocon ’16”, Thermal Theories of Continua: Survey and Developments, University of Messina, Italy, 19-22 April 2016.
- 2017 Topics on Non-Equilibrium Thermodynamics of dissipative processes in complex media. Joint European Thermodynamics Conference (JETC 2017), Budapest, Hungary, 21 - 26 May 2017.

## 6) Member of Editorial Boards

- Scientific Bulletin, Series A, Applied Mathematics and Physics, University Politecnica of Bucharest - Romania.
- Journal of Applied Sciences, Balkan Society of Geometers, Geometry Balkan Press.

Prof. V. Ciancio is the author of more than 110 publications.



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