

CURRICULUM VITAE



PERSONAL INFORMATION

Name: **Tommaso RUGGERI**

- Place and Date of Birth: Messina, 31/07/1947
- Website: <http://www.dm.unibo.it/~ruggeri/>
- Email: tommaso.ruggeri@unibo.it
- ORCID: 0000-0002-7588-207

CURRENT POSITION AND AFFILIATION

- Alma Mater Professor - Bologna University – since 1 November 2017.

PREVIOUS POSITIONS

- Full Professor of Mathematical Physics. Department of Mathematics – University of Bologna 1980- until 31 October 2017.
- Associate professor of Rational Mechanics –University of Bologna 1973-1980.
- Assistant professor of Rational Mechanics –University of Messina 1969-1973.

EDUCATION

- Master's Degree in Theoretical Physics (*magna cum laude*) 30/6/1969 – University of Messina.

RESEARCH ACTIVITY

Professor T. Ruggeri is author of 230 publications, among which there are 3 books and 3 monographs. His research activity is devoted to several Mathematical Physics problems, and in particular to non-linear wave propagation problems for hyperbolic systems and thermo-mechanics of continuous media (classical and relativistic).

In the first field, he produced original contributions concerning the symmetrisation of hyperbolic systems of balance laws with convex entropy density and concerning the theory of acceleration and shock waves. In the field of non-equilibrium thermodynamics, he has been one of the founders of modern Extended Thermodynamics and has written, jointly with Ingo Mueller, the well-known book *Rational Extended Thermodynamics* (Springer-Verlag, 1993 and

1998). Recent papers are devoted to a new approach of non-equilibrium thermodynamics including polytropic gases, moderate dense gases and mixture of gases. These results are collected in a recent book written jointly with Masaru Sugiyama *Rational Extended Thermodynamics beyond Monatomic Gas*, (Springer-Verlag, 2015).

AWARDS

- 1975: Bonavera prize of the *Accademia delle Scienze di Torino* for the best research in Applied Mathematics for young researchers.
- 1999: Elected Member of the National *Accademia dei Lincei* in the class of Mechanics and Applied Mathematics.
- 2001: Elected Member of the *Accademia Peloritana dei Pericolanti* di Messina.
- 2003: Invited to give the opening lecture to the *Unione Matematica Italiana* Meeting (Milan).
- 2007: An international scientific conference was dedicated to him for his 60 years – *Waves and Stability in Continuous Media* (WASCOM 2007) Scicli (Ragusa) organized by INdAM.
- 2009: Elected Member of the *Accademia delle Scienze dell'Istituto di Bologna* (Accademico Benedettino).
- 2009: Invited to give the inaugural lecture (prolusione) to the *922 Academic Year of the University of Bologna*.
- 2012: Prize of KIWANIS International - Messina Nuovo Ionio.
- 2013: Elected National Member of the *Accademia di Scienze Fisiche e Matematiche di Napoli*.
- 2016: Elected National Member of *Accademia Nazionale dei Lincei*.
- 2017: An international scientific conference was dedicated to him for his 70 years in Bologna *Waves and Stability in Continuous Media* (WASCOM 2017) organized by Alma Mater Studiorum University of Bologna and the Mathematical Department of Bologna University with the participation of the Rector of Bologna University Prof. Francesco Ubertini (<https://events.unibo.it/wascom2017>).
- 2018: International Prize Angiola Gili e Cataldo Agostinelli of the *Accademia di Torino* per la Meccanica Pura o Fisica Matematica classica (<https://www.accademiadelle scienze.it/attivita/premi-e-borse/premio-gili-agostinelli>).

RECENT RESEARCH FUNDINGS

2000-02, 2003-05, 2005-07 National Coordinator of the Project of the National Interests of MURST: *Nonlinear Mathematical Problems of Wave Propagation and Stability in Models of Continuous Media*.

FARB 2012-2014 Project: *Extended Thermodynamics of Non-Equilibrium Processes from Macro- to Nano-Scale*.

Progetto Premiale MATHTECH CNR-INdAM 2015.

VISITING POSITIONS AND LECTURES:

He was invited to deliver lectures at several international meetings and in many Universities as Visiting Professor. In particular:

Visiting:

Providence – Brown University - (1984) invited by Prof. Dafermos;
Paris (1984) invited by Prof. Y. Choquet-Bruhat;
Berlin (1985, 1990, 1996, 2000) invited by Prof. Mueller;
Marseille (2001, 2003, 2007, 2008, 2009,2010) invited by Prof. H. Gouin;
Novi-Sad (2003, 2005, 2006, 2009, 2015) invited by Proff. S. Simic and T. Atanacković;
Nagoya (2003, 2006, 2008, 2010,2013, 2014, 2015, 2016) invited by Prof. M. Sugiyama;
Hong Kong (2007, 2008, 2010, 2011) invited by Prof. C. Rogers;
Sydney (2007) invited by Prof. C. Rogers;
Birmingham (2008) invited by Prof. Y. D. Shikhmurzaev;
Chengdu (2008, 2010, 2011) invited by Prof. N. Zhao;
Mumbai (2009) invited by Prof. V. D. Sharma;
Stanford (2010) invited by Prof. Tai Ping Liu;
Shanghai – Fudan University (2011) invited by Prof. Zongmin Wu;
Kitakiushu (2015, 2017) invited by Prof. Shigheru Taniguchi;
Yokoyama (2017) invited by Dr. Takashi Arima;
Seul (2014, 2016) invited by Prof. Seung-Yeal Ha;
Shanghai (2017) invited by Prof. Jie Lou.

General invited Lectures:

University of Texas (Dallas 1980), WASCOM Meetings (from 1981 to 2015 every 2 years), Oberwolfach (1981, 1983, 1985, 1992, 1996, 1997, 2000, 2002, 2004, 2008), Collège de France (Paris 1984), Brown University (1984), Minnesota (Minneapolis 1984), Toronto (1984), Accademia dei Lincei (1984, 1986, 1988, 2016), Berlin (1985, 1998, 2005, 2011), Paris (1988, 1993), Warsaw (1990, 1996, 2005), IPERXX Meetings (from 1993 to 2011), Blauberun (2000), Seehim-Jugenheim (2001), Potsdam (2001), Heidelbergh (2001), Marseille (2001, 2003, 2007, 2008, 2013), Nagoya (2003, 2006, 2008, 2010, 2013), Kyoto (2003, 2006, 2013), Osaka (2004, 2006), Xi'an (2004), Shanghai (2005, 2017), Clermont-Ferrand (2005), Belgrade (2006), Koriyama (2006), Tallin (2006), China-Italian Meeting (2004, 2006, 2008, 2010, 2012, 2014,2016), Dublin (2006), Hong Kong (2007, 2010), Sydney (2007), Melbourne (2007), Birmingham (2008), Chongqing (2008), Chengdu (2008, 2010), Palic (2009), Mumbai (2009), Stanford (2010), Providence (Brown University) (2011), Taipei (2012), JAXA –Sagamihara (2013), IHES- Bures-sur-Yvette (Paris, 2014, 2015), Fukuoka (2014, 2017), Novi Sad (2014, 2015), Seoul (2014, 2015, 2016), Rio de Janeiro (2016), Beijing (2017).

ORGANISATION OF CONFERENCES, WORKSHOPS, SCHOOLS:

Wascom series Conferences, GNFM Ravello Summer Schools (every year since 2000) and many others (see web page).

MEMBER OF THE EDITORIAL BOARD:

Member of the Editorial board of Cont. Mech. and Thermody. (Springer) 1989-2006.
Member of the Editorial board of Rend. Lincei, Matematica ed Applicazioni (EMS) since 1999.

Member of the Editorial board of *Ricerche di Matematica* (Springer) since 2005.

Member of the Editorial board of *BUMI* since 2007-2013.

Member of the Editorial board of *International Journal of Non-Linear Mechanics* (Elsevier) since 2012.

Member of the Editorial board of *Springer INdAM Series* since 2013.

JOURNAL REFEREEING:

Journal of Mathematical Physics, Physical Review A, Physical Review B, Physical Review E; Physics of Fluids, Physics Letters, Physica D: Nonlinear Phenomena; Annals of Physics; Journal of Physics A: Mathematical and General; Nuovo Cimento; Meccanica; Annali Matematica Pura ed Applicata; Bollettino Unione Matematica Italiana; Rendiconti del Circolo Matematico di Palermo; Wave Motion; Zeitschrift für Angewandte Mathematik und Physik, International Journal of Mathematics and Mathematical Sciences; Acta Mechanica, Journal of Mathematical Analysis and Applications, Archive Rational Mechanics and Analysis, Continuum Mechanics and Thermodynamics, Comptes Rendus de l'Académie des Sciences; International Journal of Engineering Science; Applied Mathematical Modelling; Applied Mathematics and Computation; Chaos, Solitons & Fractals; Computers and Mathematics with Applications; European Journal of Mechanics - B/Fluids; International Journal of Engineering Science; International Journal of Non-Linear Mechanics; Physics Letters A. Mechanics Research Communications.

AFFILIATIONS

He's member of:

I.S.I.M.M. (International Society for the Interaction of Mechanics and Mathematics);

G.N.F.M. (Gruppo Nazionale Fisica Matematica);

I.N.F.N. (Istituto Nazionale di Fisica Nucleare);

U.M.I. (Unione Matematica Italiana);

A.M.S. (American Mathematical Society);

S.I.M.A.I. (Società Italiana Matematica Applicazioni Industriali).

PREVIOUS STUDENTS:

A. Strumia (Full Professor, Bari), A. Muracchini (Full Professor, Bologna), L. Seccia (Associate Professor, Bologna), F. Brini (Associate Professor, Bologna), A. Mentrelli (Associate Professor, Bologna).

Foreign Post Doc: J. Au (Industrial Engineer - Berlin), S. Simic (Full Professor – Novi Sad), J. Lou (Associate Professor- Shanghai), N. Zhao (Full Professor- Chengdu), S. Taniguchi (Associate Professor - Kitakyushu), T. Arima (Assistant Professor - Yokohama).

TEACHING ACTIVITY

- He taught *Meccanica Razionale* for 44 years since 1973 for students of the Engineering Faculty

(Ingegneria Civile, Edile, Ambientale, Chimica e Nucleare);

- He taught *Fisica Matematica* since 2006 for *Laurea Magistrale Ingegneria Civile*.
- Moreover, he taught several Courses of *Istituzioni di Matematica* for students of Political Sciences and students of Engineering in Forlì and Reggio Emilia.
- He taught several courses for PHD students in Mathematics and Civil Engineering and he belonged for several years to the Mathematical PHD Scientific Committee in Bologna. Moreover, he taught a course of PHD for Mathematical students at Messina University.
- Abroad, he taught some PHD courses in Nagoya (Japan 2001) and in Seoul (South Korea 2016).
- He was supervisor for the thesis preparation of 5 Master students and 1 PHD student and supervisor of 2 Research Grants Students.

- He wrote several teaching books:

1) *Appunti di Meccanica Razionale. Richiami di Calcolo Vettoriale e Matriciale*. Pitagora ed. Bologna (1989). 2) *Laboratorio di Matematica - Primo Corso: Temi di Analisi Matematica e Software Matematico*. In Coll. con S. Matarasso. Progetto Leonardo - Esculapio Ed. Bologna (1991). 3) *Laboratorio di Meccanica Razionale: Esercizi, Temi di esame e Software Matematico*. In Coll. con A. Muracchini, L. Seccia. Progetto Leonardo - Esculapio Ed. Bologna (1991). 4) *Labmat2 - Dispense di Analisi Matematica II con l'utilizzo di Software Matematico. Vol. 1: Funzioni reali di più variabili; Applicazioni nel campo complesso; Programma Tredimw.exe*. In Coll. con S. Matarasso. Progetto Leonardo - Esculapio Ed. Bologna (1993). 5) *Labmat2 - Dispense di Analisi Matematica II con l'utilizzo di Software Matematico. Vol. 5: Elementi di Equazioni differenziali con esempi di dinamica del punto; Temi di esame di Analisi II; Programma Diff2w.exe; Worksheets con Maple V*. In Coll. con S. Matarasso. Progetto Leonardo - Esculapio Ed. Bologna (1994). 6) *Analisi Matematica 2: Calcolo Differenziale*. In Coll. con S. Matarasso. Progetto Leonardo - Esculapio Ed. Bologna (1995). 7) *Esercizi e temi d'esame di Meccanica Razionale*. In Coll. con A. Muracchini, L. Seccia. Progetto Leonardo - Esculapio Ed. Bologna (1997). 8) *Esercitazioni di Meccanica Razionale con Matlab e Simulink*. In Coll. con A. Muracchini, L. Seccia. Progetto Leonardo - Esculapio Ed. Bologna (1997). 9) *Esercizi e temi d'esame di Meccanica Razionale per i Corsi di Laurea Triennale in Ingegneria*. In Coll. con A. Muracchini, L. Seccia. Progetto Leonardo - Ed. Esculapio, Bologna (2005). 10) *Meccanica Razionale per l'Ingegneria*. In Coll. con P. Biscari, G. Saccomandi, M. Vianello. Ed. Monduzzi, Bologna (2005). 11) *Introduzione alla Termomeccanica dei Continui. Ed. Monduzzi (2007)*. 12) *Meccanica Razionale*. In Coll. con P. Biscari, G. Saccomandi, M. Vianello. Ed. Springer, Milano (2013, 2015). 13) *Introduzione alla Termomeccanica dei Continui. II Edizione Riveduta e Corretta Ed. Monduzzi, Milano (2013, 2016)*.

THIRD MISSION

Prof. Ruggeri is Coordinator of the Bologna Section of “*I Lincei per una Didattica nelle Scuole: Una rete Nazionale*” organized by the Accademia Nazionale dei Lincei. Moreover, he gave several conferences for scientific dissemination: Festival della Scienza (Palermo 2009); Meeting “Nuovi Licei: l’Avventura della Conoscenza” – Fondazione San Paolo con il Patrocinio del MIUR (Roma 2010); Summer School “Fisica in Moto” (Ducati – Bologna 2011); Conferenze della Facoltà di Ingegneria (Bologna 2011); VIII Festival Scienza e Filosofia (Foligno 2017).

MANAGING ACTIVITY

- President of the Scientific Committee of the Istituto Nazionale di Alta Matematica (INdAM)

since 2011.

- Director of the National Group of Mathematical Physics (GNFM) of INdAM 2000-2017.
- Member of the Scientific Committee of the Istituto Nazionale di Alta Matematica (INdAM) since 2000.
- Scientific Coordinator of the Alma Mater Research Center on Applied Mathematics AM² of University of Bologna since 2014.
- Member of the Executive Committee of the International Society for the Interaction of Mechanics and Mathematics (ISIMM) 2008-2014.
- Vice Dean of Engineering Faculty of University of Bologna 1995-2001.
- Director of Interdepartmental Research Centre of Applied Mathematics (CIRAM) 1991-1997.

BIBLIOMETRIC INDEXES

In Google Scholar Citations <http://scholar.google.it/citations?user=u9bjPgYAAAAJ&hl=it> Prof. Ruggeri has 6917 citations with h-index = 39 and he belongs to the Top Italian Scientist web site http://www.topitalianscientists.org/top_italian_scientists.aspx

According to Researchgate: https://www.researchgate.net/profile/Tommaso_Ruggeri he has a score 36.89 higher than 95% of Reserchgate Members.

SCIENTIFIC PRODUCTION AND PUBLICATIONS

Professor T. Ruggeri is author of 230 publications, among which there are 3 books and 3 monographs.

25 PRINCIPAL PUBLICATIONS (for the full bibliography see: http://www.dm.unibo.it/~ruggeri/bib_ruggeri2.html).

Books:

- 1) MUELLER I, RUGGERI T., "**Extended Thermodynamics**", Springer Tracts in Natural Philosophy, **37**, pp.: 231, (1993).
- 2) MUELLER I, RUGGERI T., "**Rational Extended Thermodynamics**", Springer Tracts in Natural Philosophy, **37**, pp.: 397, ISBN/ISSN: 0-387-98373-2, (1998).
- 3) RUGGERI T., SUGIYAMA M., "**Rational Extended Thermodynamics beyond Monatomic Gas**". Springer, pp.: 376, ISBN 978-3-319-13340-9, (2015).

Chapters in Books:

- 4) RUGGERI T., "**Extended Relativistic Thermodynamics** in the book of Yvonne Choquet Bruhat *General Relativity and the Einstein equations*, pp. 334-340. Oxford Univ. Press, ISBN 978-0-19-923072-3, (2009).
- 5) RUGGERI T., "**Some recent results on multi-temperature mixture of fluids**", in *Continuous Media with Microstructure*, B. Albers (Ed.), Springer –Verlag ISBN: 978-3-642-11444-1(2010).

Papers:

- 6) BOILLAT G., RUGGERI T., "**Reflection and transmission of discontinuity waves through a shock wave. General theory including also the case of characteristic shocks**", *Proceedings of the Royal Soc. of Edinburgh*. 83-A, pp.17-24 (1979).
- 7) BOILLAT G., RUGGERI T., "**On the evolution law of the weak discontinuities for hyperbolic quasi-linear systems**", *Wave Motion*, 1, (2), pp.149-152 (1979).
- 8) RUGGERI T., STRUMIA A., "**Main field and convex covariant density for quasi-linear hyperbolic systems. Relativistic fluid dynamics**", *Ann. Inst. H. Poincaré*, **34**, pp.: 19, (1981).
- 9) CHOQUET BRUHAT Y., RUGGERI T., "**Hyperbolicity of the 3+1 system of Einstein equations**", *Comm. Math. Phys.*, **89**, pp. 269-275 (1983).
- 10) LIU I.S., MÜLLER I., RUGGERI T., "**Relativistic thermodynamics of Gases**", *Annals of Physics*, **169** (1), pp. 191-219 (1986).
- 11) RUGGERI T., "**Galilean Invariance and Entropy Principle for Systems of Balance Laws. The Structure of the Extended Thermodynamics**", *Continuum Mech. Thermodyn.*, **1**, pp. 17 (1989).
- 12) BOILLAT G., RUGGERI T., "**Hyperbolic Principal Subsystems: Entropy Convexity and Subcharacteristic Conditions**", *Arch. Rat. Mech. Anal.*, **137**, pp.: 15 (1997).
- 13) BOILLAT G., RUGGERI T., "**Moment Equations in the Kinetic Theory of Gases and Wave Velocities**", *Continuum Mech. Thermodyn.* 9, pp. 205-212 (1997).
- 14) LIU T.P., RUGGERI T., "**Entropy Production and Admissibility of Shocks**", *Acta Math. Appl. Sin., Engl. Ser.* **19** (1), pp. 1-12 (2003).
- 15) RUGGERI T., SERRE D., "**Stability of Constant Equilibrium State for Dissipative Balance Laws System with a Convex Entropy**", *Quart. of Appl. Math.*, **62** (1), pp. 163-179 (2004).
- 16) RUGGERI T., SIMIC S., "**On the hyperbolic system of a mixture of Eulerian Fluids: A comparison between single- and multi-temperature models**", *Math. Meth. Appl. Sci.*, **30**, pp. 827-849 (2007).
- 17) RUGGERI T., SIMIC S., "**Average Temperature and Maxwellian Iteration in Multi-temperature Mixtures of Fluids**". *Phys. Rev. E* **80**, 026317 (2009).
- 18) RUGGERI T., LOU J., "**Heat Conduction in multi-temperature mixture of fluids: the role of the average temperature**". *Phys. Letters A* **373**, 3052 (2009).
- 19) LOU J., RUGGERI T., "**The dynamics of spreading and immune strategies of sexually transmitted diseases on scale-free network**". *Journal of Mathematical Analysis and Applications* **365** (1), 210-219 (2010).
- 20) ZHAO N., MENTRELLI A., RUGGERI, T., and SUGIYAMA M., "**Admissible shock waves and shock-induced phase transitions in a van der Waals fluid**". *Physics of Fluids* **23**, 086101-1, 086101-18 (2011).
- 21) ARIMA T., TANIGUCHI S., RUGGERI, T. and SUGIYAMA M., "**Extended thermodynamics of dense gases**", *Continuum Mech. Thermodyn.* **24** 271-292 (2012).
- 22) ARIMA T., TANIGUCHI S., RUGGERI T. and SUGIYAMA M., "**Thermodynamic theory of the shock wave structure in a rarefied polyatomic gas: Beyond the Bethe-Teller theory**". *Phys. Rev. E* **89**, 013025, (2014).
- 23) HA S-Y., RUGGERI T. "**A thermodynamic consistent model for emergent behavior in Flocks and comparison with multitemperature mixture of fluids**". *Arch. Rational Mech. Anal.* **223**, 1397-1425 (2017).
- 24) PENNISI S., RUGGERI T. "**Relativistic Extended Thermodynamics of Rarefied Polyatomic Gases**". *Annals of Physics*, **373**, 414-445 (2017).
- 25) ARIMA T., RUGGERI T., SUGIYAMA M. "**Rational Extended Thermodynamics of a Rarefied Polyatomic Gas with Molecular Relaxation Processes**". *Phys Rev E* **96**, 042143-1, 042143-20 (2017).