

# Renzo Piva

## *Short Curriculum Vitæ*

Renzo Piva was born in Rome, May 21, 1940.

### **Present position**

- Professor Emeritus, School of Engineering, Università di Roma “La Sapienza”

### **Positions held**

- Professor of Fluid Dynamics, School of Engineering, Università di Roma “La Sapienza” 1980-2010
- Visiting Professor, Department of Aerospace Sciences, Boston University, 1984
- Associate Professor, Institute of Applied Mechanics, Engineering School, Università di Roma, 1976-1980
- Associate Professor, Institute of Aerodynamics, Aerospace Engineering School, Università di Roma, 1972-1976
- Senior Research Scientist and Adjunct Professor, Department of Aeronautics and Astronautics, New York University, 1970-1972
- Assistant Professor, Institute of Aerodynamics, Aerospace Engineering School, Università di Roma, 1968

### **Education**

- Degree of the Aerospace Engineering School, Università di Roma, 1968
- Master Degree in Mechanical Engineering, Università di Roma, 1965

## Management Activity in Scientific and Technical Organizations

- Ph.D. programme in Theoretical and Applied Mechanics of Università di Roma “La Sapienza”: Coordinator, 1984-1990
- Department of Mechanics and Aeronautics: Director 1995-1998
- “Sapienza Innovazione”: Board of Directors, Vice President, 2005-2009
- SSAS (Scuola Superiore Studi Avanzati Sapienza): Board of Directors, 2011-2015
- CNR (National Research Council), Engineering Committee, 1975-1981
- ASI (Italian Space Agency), Board of Directors, 1998-2003
- CIRA (Italian Aerospace Research Center): President, 2008-2009; Board of Directors, 2005-2008
- Fondazione i Lincei per la scuola: Board of Directors, 2015-2018
- Accademia dei Lincei, Executive Board, 2017-present

## Scientific Coordination Activity

- Scientific Committees
  - IAC (Institute for Calculus Applications), CNR, Roma (1990-1998)
  - ERCOFTAC (European Research Community on Flow Turbulence and Combustion), Brussels, (1992-1994)
  - Von Karman Institute, Brussels (1992-1996)
  - Centro Dinamica Fluidi, CNR, Torino, Italy (1990-1996)
  - CIRA (Italian Center for Aerospace Research) (1993-1996)
  - EuroMech Fluid Mechanics Committee, (1996-1998)
  - EuroMech Turbulence Committee, (1998-2003)
  - INSEAN (Italian Ship Model Basin) (2002 to 2006)
- Editorial Board of International Journals
  - Meccanica (Associate Editor 1998-2004)
  - Computational Mechanics

- Journal of Mathematical and Physical Sciences
- International Journal of Non-Linear Mechanics
- Rendiconti Lincei Matematica e Applicazioni
- Conference Organization
  - Numerical Methods in Fluid Dynamics GAMM, 1983 – Roma “La Sapienza”
  - AIMETA, 1986 – Roma “La Sapienza”
  - IABEM-90 Symposium, 1990 – Roma “La Sapienza”
  - V European Turbulence Conference, 1994 – Siena
- Reviewer for International Journals
  - Journal of Fluid Mechanics, Physics of Fluids, Fluid Dynamics Research, Flow Turbulence and Combustion, European Journal of Mechanics, Computational Fluid Mechanics, Computer & Fluids . . .

## Memberships

- Istituto Lombardo Scienze e Lettere, Italy (since 2008)
- Accademia Dei Lincei, class of Physical and Mathematical Sciences, Italy (correspondent since 1993, national fellow since 2010)
- SIAM (Applied Mathematics), Fellow since 2009, USA
- Scientific Organizations
  - AIMETA (Theoretical and Applied Mechanics), Italy
  - SIMAI (Applied and Industrial Mathematics), Italy
  - APS (American Physical Society), USA
  - AIDAA (Aerospace), Italy
  - GAMM (Committee for Fluid Dynamics), Germany
  - ECCOMAS (European Committee on Computational Methods in Applied Science), Brussels

## Scientific Activity

Main subjects of research include:

- Magnetohydrodynamics
- Supersonics and transonic flows
- Natural Convection and Thermocapillar flows
- Computational Methods for Navier Stokes equations
- Two phase flows
- Boundary integral equations for Aerodynamics and Naval Idrodynamics
- Vorticity Dynamics
- Transition and Turbulence
- Turbulence in complex flows with microbubbles and polymers
- Biological Fluid Dynamics and self-propulsion

### **Publications and Keynote Lectures**

- Author of about 150 papers, mainly published in International Scientific Journals and in International Conference Proceedings. Invited Speaker in several International and National Conferences. See below the most significant contributions, from recent to earlier activity.

#### *Selected Publications*

1. C. Nicolai, B. Jacob, Gualtieri, R. Piva, “Inertial Particles in Homogeneous Shear Turbulence: Experiments and Direct Numerical Simulation”, *Flow Turb and Comb.*, 92, 2014
2. C. Nicolai, B. Jacob, R. Piva, “On the spatial distribution of small heavy particles in homogeneous shear turbulence”, *Phys. Fluids*, 25, 2013.
3. N. Saikrishnan, E. De Angelis, E.K. Longmire, I. Marusic, C.M. Casciola, R. Piva, “Reynolds number effects on scale energy balance in wall turbulence”, *Phys. Fluids*, 24, 2012.
4. E. De Angelis, C.M. Casciola, R. Piva, “Energy spectra in viscoelastic turbulence” *Phys. D*, 297- 303, 241, 2012.

5. B. Jacob, A. Olivieri, M. Miozzi, E. Campana, R. Piva, "Drag reduction by microbubbles in a turbulent boundary layer", *Phys. Fluids*, 115104 22(11), 2010.
6. P. Gualtieri, C.M. Casciola, R. Benzi, R. Piva, "Preservation of statistical properties in Large Eddy Simulation of shear turbulence", *Journal Fluid Mech.*, **592**, 471-494 2007.
7. C.M. Casciola, P. Gualtieri, B. Jacob, R. Piva, "The residual anisotropy at small scales in high shear turbulence", *Phys. Fluids*, **19** 10, 2007.
8. M. Chinappi, E. De Angelis, S. Melchionna, C.M. Casciola, S. Succi, R. Piva, "Molecular dynamics simulation of ratchet motion in an asymmetric nano-channel", *Phys. Rev. Lett.*, **97**, 144509, 2006
9. C.M. Casciola, P. Gualtieri, B. Jacob, R. Piva, "Scaling properties in the production range of shear dominated flows", *Phys. Rev. Lett.*, **95**, 024503, 2005.
10. De Angelis E., Casciola C.M., Benzi R., Piva R., "Homogeneous isotropic turbulence in dilute polymers", *Journal Fluid Mech.*, **531**, 1-10, 2005.
11. Marati N., Casciola C.M., Piva R. "Energy cascade and spatial fluxes in wall turbulence" *J. Fluid Mech.* 2004, **521**
12. De Angelis E. Casciola C.M., L'Vov V.S., Procaccia I., Piva R. "Effect of polymers on turbulence in channel flow: rigidity of the best modes and energy redistribution" *Phys. Rev. E.* 2003, **67**
13. Casciola C.M., Gualtieri P., Benzi R., Piva R., "Scale by scale budget and similarity laws for homogeneous shear flow" *J. Fluid Mech.* **476**, 105-114, 2003.
14. Casciola C.M., Benzi R., Gualtieri P., Jacob B., R.Piva, "Double scaling in shear dominated flow", *Phys. Rev. E*, **65**, 2002.
15. Gualtieri P., Casciola C.M., Benzi R., Amati G., Piva R., "Scaling laws and intermittency in homogeneous shear flows", *Physics of Fluids*, **14** (2), 583-596, 2002.
16. De Angelis E., Casciola C.M., Piva R., "DNS of wall turbulence: dilute polymers and self-sustaining mechanisms", *Computers & Fluids*, 31/4-7, 495-507, 2002.
17. Riccardi G., Piva R., "The Interaction of an Elliptical Patch with a Point Vortex", *Fluid Dynamics Research*, **27**, pp. 269-289, 2000.
18. Ponziani D., Casciola C.M., Zirilli F., Piva R., "A weakly nonlinear model for a localized disturbance in Poiseuille flow", *Studies in Applied Math.*, 105, pp. 121-141, 2000.

19. Toschi F., Amati G., Succi S., Benzi R., Piva R., “Intermittency of Structure Functions in Channel flow Turbulence”, *Phys. Rev. Lett.* Vol. 82, n. 25, pp. 5044–5047, 1999.
20. Benzi R., Amati G., Casciola C.M., Toschi F., Piva R., “Intermittency and Scaling for Wall Bounded Flows”, *Physics of Fluids*, Vol. 11, N. 6, pp. 1–3, 1999.
21. Amati G., Succi S., Piva R., “Preliminary analysis of the scaling exponents in channel flow turbulence”, *Fluid Dynamics Research*, Vol. 24, pp. 201–209, 1999.
22. Bassanini P., Casciola C.M., Lancia M.R., Piva R., “Uniqueness of the Bounded Flow Solution in Aerodynamics”, *Journal of Computational Mechanics*, Vol. 22 (1998), 12–18.
23. Casciola C.M., Piva R., “A Lagrangian approach for vorticity intensification in swirling rings”, *Journal of Computational Mechanics*, Vol. 21 (1998), 276–282.
24. Riccardi G., Piva R., “Motion of an elliptical vortex under rotating strain: conditions for asymmetric merging”, *Fluid Dynamics Research*, Vol. 23 (1998), 63–88.
25. Bassanini P., Casciola C.M., Lancia M.R., Piva R., “A Theoretical Model for Multi-connected Wings”, *Euro. J. Appl. Math.* 9, 6, 607–634, 1998.
26. Amati G., Succi S., Piva R., “Massively Parallel Lattice Boltzmann Simulations of Turbulent Channel Flow”, *International Journal of Modern Physics C*, Vol. 8(4), pp. 869, 1997.
27. Casciola C.M., Bassanini P., Piva R., “Vorticity generation on a flat plate in 3D flows”, *Journal of Computational Physics*, Vol. 129, 345–356, 1996.
28. Bassanini P., Casciola C.M., Lancia M.R., Piva R., “On the trailing Edge singularity and Kutta conditions for 3-D airfoils”, *European Journal of Mechanics - B/Fluids*, Vol. 15, No. 6, pp. 809–830, 1996.
29. Riccardi G., Piva R., Benzi R., “A physical model for merging in 2D decaying turbulence”, *Physics of Fluids*, 7, December 1995, pp. 3091,3104.
30. Graziani G., Ranucci M., Piva R., “From a Boundary Integral Formulation to a viscous vortex method”, *Journal of Computational Mechanics*, 15, pp. 301-314, 1995.
31. Krisels P.C., Peters M.C.A.M., Hirschberg A., Wijnands A.P.J., Iafrati A., Riccardi G., Piva R., Bruggeman J., “High Amplitude Vortex-Induced Pulsations in a Gas Transport System”, *Journal of Sound and Vibrations*, 184(2), 343-368, 1995.

32. Riccardi G., Piva R., "The inviscid dynamics of vorticity structures and their interaction with a solid body", *Journal of Computational Mechanics*, **13**, pp. 116-132, 1993.
33. Bassanini P., Casciola C.M., Lancia M.R., Piva R., "A Boundary Integral Formulation for the Kinetic Field in Aerodynamics. Part II: Applications to Unsteady 2-D Flows", *European Journal of Mechanics - B/Fluids*, **11**, no. 1, 69-92, 1992.
34. Bassanini P., Casciola C.M., Lancia M.R., Piva R., "A Boundary Integral Formulation for the Kinetic Field in Aerodynamics. Part I: Mathematical Analysis", *European Journal of Mechanics - B/Fluids*, **10**, no. 6, pp. 605-627, 1991.
35. Mansutti D., Graziani G., Piva R., "A Discrete Vector Potential Model for Unsteady Incompressible Viscous Flows", *Journal of Computational Physics*, **92**, no. 1, January 1991.
36. Piva R., Morino L., "Vector Green's Function method for unsteady Navier Stokes equations". *Meccanica*, **22**, pp. 76-85, 1987.
37. Piva R., Graziani G., Morino L., "Green's Function method for viscous unsteady free surface flows". *Computational Mechanics* **86**, Tokyo, Springer Verlag, 1986.
38. Strani M., Piva R., Graziani G., "Thermocapillary Convection in a Rectangular Cavity: Asymptotic Theory and Numerical Simulation". *Journal of Fluid Mechanics*, **130**. pp. 347-376, 1983.
39. Strani M., Piva R., "Surface Tension Driven Flows in Microgravity conditions", *Int. Journal for Numerical Methods in Fluids*, **2**, pp. 367-386, 1982.
40. Graziani G., Strani M., Piva R., "Effect of Free Surface Radiation in Axisymmetric Thermocapillary Flows". *Acta Astronautica*, **9**, n. 4, pp. 231-243, May 1982.
41. Di Giacinto M., Sabetta F., Piva R., "Two-Way Coupling effects on gas particle flows". *ASME Journal of Fluid Engineering*, pp. 304-313, 1982.
42. Sestieri A., Piva R., "The Influence of Fluid Inertia in Unsteady Lubrication Films". *ASME Journal of Lubrication*, **104**, pp. 180-186, April 1982.
43. Piva R., Di Carlo A., Guj G., "F.E. MAC Scheme in general Curvilinear Coordinates". *Computers & Fluids*, **8**, pp. 225-241, 1980.
44. Piva R., Di Carlo A., "Appropriate interpolation schemes for F.E. models of viscous incompressible flows". *Meccanica*, **13**, pp. 238-242, 1978.

45. Di Carlo A., Piva R., "A Mixed F.E. model for viscous incompressible flows". *Meccanica*, **10**, pp. 178-182, 1975.
46. Piva R., Srokowski A., "Cross-Flow Influence on slot cooling effectiveness". *AIAA Journal of Aircraft*, **12**, no. 7, July 1975.
47. Orlandi P., Piva R., "Non uniform mesh effects on numerical solutions for recirculating flows". *ASME Journal of Applied Mechanics*, **42**, no. 1, March 1975.
48. Piva R., Orlandi P., "Numerical solutions for atmospheric boundary layer flows over street canyons". *Lecture Notes in Physics*, no. 35, pp. 319-326, Springer-Verlag, 1975. and translated into russian in *Mechanika*, no. 14, pp. 127-134, Moscow, 1977.
49. Piva R., "Interaction between an Upstream Facing Wall Jet and a Supersonic Stream". *AIAA Journal*, **12**, no. 1, January 1973.
50. Piva R., *Leading edge cooling by upstream injection*. NASA-CR-111965, June 1971.

*Selected Keynote Lectures*

1. "Navier Stokes flows with suspended particles: mathematical modelling and numerical simulation", IUTAM, Delft 1977
2. "Mathematical and Computational Models for Two-Phase Flows", *Sromungmechanick*, Magdberg 1979.
3. "The Boundary Integral Equation Method for Euler and Navier Stokes Equations", *Int. Symp. on Comp. Fluid Mech*, Nagoya 1989.
4. "Fluids with Microstructure & Turbulence", AIMETA, Ferrara 2003
5. "Complex phenomena & large scale simulations in fluids", SIMAI, Venice 2004
6. "Turbulence of Drag reducing polymer solutions", ETC XI, Porto 2007