

Keynotes about the professional history

- Ermanno Cardelli, obtained MSc degree in electrical engineering in 1981, in the Pisa University, presenting the Thesis Dissertation titled: "Determination of electrical fields in domains with linear media using the Finite Element Method: applications to aerial electrical lines".
- He has been habilitated as professional engineer in 1981, and from 1982 is a member of the Register of Professional Engineers of Perugia.
- In 1982 he worked, as external contractor, in the Institute of Electrotechnics of the school of Engineering of the University of Pisa, when he has been charged to develop during the biennium 1982-1983 FEM computer codes for the 3-d numerical calculation of electrostatic fields in open boundary configurations.
- In 1984 was admitted to the first cycle of the PhD in electrical engineering in the University of Pisa and in 1987 has been nominated PhD in electrical engineering, after a national contest and the discussion of his PhD dissertation titled: "The electric field propulsion". In the same period, and in strict relation with his PhD dissertation he has been involved in a research program in cooperation with the European Space Agency, about the study and the realization of a prototype of an electric field emission propeller using liquid Cesium, for the geostationary orbital stations keeping.
- From 1/1/1988 to 31/5/1990 he joined, as technical researcher (tecnico laureato) the Institute of Electrotechnics of the University of Pisa (from 1/1/1990 the name has been changed in Department of Electrical System and Automation). During this period he continued his research activity, and in addition has been appointed as technical responsible of the laboratory. In this role he participated to a European research project, in cooperation with Universities of Italy, Ireland, France, Germany, and Philips, Alcatel and SGS Thompson, for the design and the realization of a prototype of an innovative power controller for artificial lighting lamps, where he cooperated to the group involved in the modeling of the electromagnetic and thermal heat.
- From 1/06/1990 to 31/10/92 he has been assistant professor (ricercatore) of Electrotechnics in the same Department. During this period he continued his research activity, and began to teach in laboratory classes.
- In 1992 he won a national contest and from 1/11/92 to 5/12/1999 has been associate professor of Electrotechnics in the school of Engineering of the University of Perugia. During this period he taught courses for undergraduate students of electrical engineering such as theory of electrical networks, electrical machines, electrical plants, electromagnetic compatibility, power electronics. In addition he taught PhD Students of industrial engineering about subjects such as modeling and numerical computation of electromagnetic fields. Moreover he has been scientific responsible of several national and international research programs as described in detail in the following.

- In 1992 he has founded and has directed to date the Laboratory of Electrotechnics of the Department of Industrial Engineering of the University of Perugia.
- In 1997 he founded and has directed to date the Laboratory of Electromagnetic Characterization of Materials of the School of Materials Engineering of the University of Perugia, branch of Terni.
- In 1999 he won a national contest and from 6/12/1999 he is full professor of Electrotechnics in the school of Engineering of the University of Perugia, where he teaches courses of basic and applied electrical engineering either for non graduate or for graduate students, and leads a research group with several assistant professors, researchers and technicians.
- From 1996 he is member of the Board of Directors of the UNAE, the Italian Register of the Qualified Electrical Enterprises.
- From 1998 to 2004 he has been Energy Manager of UMBRA ACQUE, the Regional Department of the Water Resources.
- From 2002 to 2004 he has been member of the Administrative Council of PERUGIA RETE, the City Government Networking Company.
- From 2000 to 2004 he has been elected chairman of the Committee for the Research in the Area of Industrial Engineering of the University of Perugia, the internal consultancy body for the Rector about the matter of research strategies and investments.
- From 2006 to 2010 he has been elected member of the Senatus of the University of Perugia.
- From 2011 to 2014 he has been President elected of the TUCEP, an association between universities and enterprises in Italy for the creation and the management of training courses at national and European level.
- From 2014 to date has been nominated President of the Phd School of Industrial and Computer engineering.

Memberships, etc.

- Ermanno Cardelli is member of IEEE from 1989, and Senior member from 1998.
- He is member of IEEE Magnetic Society, where he has served as member elected of the Administrative Committee (from 2011 to 2013), member of the Conference Executive Committee (from 1999 to 2005 and from 2011 to date), Chair of the Italy Chapter (from 2007 to date).

- He is treasurer elected of the IEEE Italy section (from 2011 to 2014).
- He is chair elected of the IEEE Italy section (from 2014 to date)
- From 1986 he is member of the AEIT (equivalent to the IEEE in Italy) and (from 2009 to date) director of the Umbria Regional Branch.
- From 1999 he is honorary member, by special invitation, of the Polish Society of Applied Electromagnetics.
- From 1996 he is member of the COMPUMAG Society.
- He is founding member of the Italian National Group of Electrical Sciences since 1985.
- He has been invited to join the New York Academy of Sciences and the American Association for the Advancement of Science.
- From 1998 to date he is member of the CEI, the Italian Standard Body in the Electric, Electronic and Telecommunications fields where in particular he gives his contribution as scientific and technical consultant in the Technical Committees 210 (Electromagnetic Compatibility) and 211 (Effects of human exposure to the electromagnetic fields).

Awards

- Recipient of the CNR (the Italian national research council) Short Mobility Award in 1998 and in 1999. This special award, with a financial stipend, is for a scientific program to develop cooperation with a foreign partner.
- Recipient of the PIERS Award 2004: “For his contribution to the Progress in Electromagnetic Research Symposium”.
- Recipient of the Best Paper Award of the annual Conference of the Italian National Group of Electrical Sciences in 2006 and 2012.
- Recipient of the 2013 IEEE Magnetic Society Italy Chapter Special Award: “For contributions to modelling and simulation of magnetic materials in electrical machines”.

Summary of his activities as an educator

Ermanno Cardelli has taught during this years the following courses to undergraduate students of the school of engineering of the University of Pisa (from 1988 to 1992) and the University of Perugia, either in Perugia or Terni branch (from 1992 to date):

- *Laboratory of electromagnetism*
- *Laboratory of Electrotechnics;*
- *Electromagnetic theory and his applications;*
- *Principles of electrical engineering;*
- *Theory of electric networks;*
- *Classical Theory of electrical machines;*
- *Power electronics and drives;*
- *Electromagnetic compatibility;*
- *Electric plants.*
- *Electric power conversion.*

He has taught the following short courses and seminars to the PhD students in electrical engineering of the University of Pisa and to the PhD students in industrial engineering of the University of Perugia:

- *Modelling of magnetic materials (2000, 2002, 2004, 2006, 2010).*
- *Computation of electromagnetic fields (1991, 1999).*
- *Electromagnetic non destructive evaluation (1998, 2000, 2006).*
- *Numerical methods in electrical engineering (1990) .*
- *Electric vehicles power train (2012).*

Ermanno Cardelli has been member of the Teacher Council for the PhD curricula in Electrical Engineering of the University of Pisa and in Industrial Engineering of the University of Perugia.

More than 320 students have discussed the MSc. Dissertation under his direction, and he has been tutor or director of more than 40 PhD Thesis.

He has been Invited Teacher in the Tutorial Course "Magnetism, Magnetic Materials and Magnetic Hysteresis" held jointly to the IEEE CEFC , Chicago 2010.

He has been invited as Distinguished Teacher in the Italian School of Phd Students in Electrical Sciences "Ferdinando Gasparini" to give a week short course titled " *Eddy Current Nondestructive Testing Techniques and Applications*". Neaples, 2012.

He has been also Invited Teacher in advanced technical and professional refresher courses for graduated engineers organized and sponsored by (a selection is listed):

- The University for Foreigners of Perugia;
- CONFINDUSTRIA, the Italian Industries Association;
- The Umbria Regional Government;
- ENEL, an International Electric Company.

Ermanno Cardelli has developed original syllabus for the experimental didactics of electrical engineers, carried out in the laboratories he directs.

He is author of two Italian edited textbooks for the undergraduate students in industrial engineering:

- **E. CARDELLI**, *Lezioni di Elettrotecnica - Reti Elettriche*, Ed. AGRAF, Perugia 1998.
- **E. CARDELLI**, **Elementi di Elettrotecnica – Macchine Elettriche**, Ed. AGRAF, Perugia 2002

and co-authors of an Italian edited didactic treatise:

- **E. CARDELLI**, F.VINCI, S. ZAFFINA, “Onde elettromagnetiche, le radiazioni non ionizzanti”, *Quaderni di medicina del lavoro*, n.5, pp.19-71, Ed. Ricerca Medica, Napoli 1998.

Summary of the scientific and technical activity

Ermanno Cardelli has been continuously involved since 1982, at the beginning of his professional history, in activities of scientific research.

His scientific and research activity, set in the research areas defined by the Italian National Group of Electrical Sciences, has been mainly addressed to studies about the following arguments:

- Electromagnetic launch and acceleration;
- Electromagnetic modeling of materials with hysteresis;
- Electromagnetic compatibility;
- Analytical and numerical methods for electromagnetic fields analysis.

The candidate’s scientific contributions can be also found in more than 150 ISI-ranked technical papers on the subjects above. He has received more than 600 total citations (ISI ranking) and his actual H- index is 14 (ISI ranking).

Ermanno Cardelli is co-author of two Italian Patents:

N. PG2000 A 0013 – System of Pulsed- hearth-synchronized injection (2000) - with L. Banetta and P. Conti. The patent deals with a new electromagnetic pumping method for the heart-accorded injection of liquids in shocked people. The system allows a more correct and effective injection of liquids into a shocked patient during the transport, compared to the traditional gravity methods. The system prototype has been realized and is currently under product engineering. Other patents are pending.

N. TR2004 A 000002 - System for the Electromagnetic Non Destructive Diagnostic of Structures for Applications in the Field of the Civil Engineering and of maintenance cultural goods (2004) - with A. Faba. The patent deals with a new electromagnetic non destructive imaging system for the control of walls and other civil engineering structures. Other patents are pending.

Ermanno Cardelli has participated to the organization of several scientific events dealing with the arguments of his studies and research: in the following are listed the principal ones:

- General chair of RTSI Torino 2015.

- General Chair of AIM Conference Bormio 2016.
- General chairman of the 2nd Hysteresis Modelling and Micromagnetics Symposium (HMM), 1999.
- General chairman of the IEEE Conference on Electromagnetic Field Calculations (CEFC), 2002.
- Chairman of the International Steering Committee of CEFC from 2005 to 2008, and member from 2000 to date.
- Member of the International Steering Committee of HMM from 1999 to date.
- Member of the Editorial Board for EML (Electromagnetic Launching Media) Conference 1992, for INTERMAG 2002, 2003, for IEEE CEFC 2000, 2004, 2006, 2008, 2010, 2012, 2014, and COMPUMAG (Conference on the Computation of Electromagnetic Fields) (1997, 1999, 2001, 2003, 2005, 2007, 2009, 2013, 2015). The selected papers were published in IEEE Trans. on Magnetics.
- Member of the Editorial Board for MMM (Magnetism and Magnetic Materials Conference) 2001 and 2002, the selected papers were published in the Journal of Applied Physics.
- Guest Editor of Physica B Elsevier for the special issue of the HMM selected papers in 1999 and 2013.
- Session chair in IEEE INTERMAG 2000, IEEE CEFC 2004, 2006, 2008, 2010, 2012, 2014, COMPUMAG 1997, 1999, 2001, 2003, 2005, 2007, 2009, 2013.
- Member of the organizing committee of the 13-th International Zurich Symp. and Techn. Exhib.on Electrom. Compat., 1999.
- Session chairman of UEES (Unconventional Electromechanical and Electrotechnical Systems) 1996, 1997, of PJ (Polish-Japanese Joint Seminary) 1997, ISTET (International Symposium on Theoretical Electrical Engineering) 1997, MIS (Micromachines and Servo drives) 1998, ET (Italian National Group of Electrical Sciences) Conference 2000, 2001, 2004, 2006, 2008, 2010, 2012.
- Symposium chair of the IEEE International Energy Conference ENERGYCON 2012.
- Chair of the Local Organizing Committee of the 6-th IEEE Magnetic Society Summer School (2013) and member of the Program Committee of the 7-th IEEE Magnetic Society Summer School (2014).

He is reviewer for the following international archival journals:

- IEEE Transaction on Magnetics;
- IEEE Transaction on Electromagnetic Compatibility;
- IEEE Transaction on Power Delivery;
- International Journal of Modeling and Simulation;
- Physica B Elsevier;
- Journal of Applied Physics;

Ermanno Cardelli has given invited papers and talks during in the following scientific events:

- “*Velocity Skin-Effects in Railguns with Solid Armatures*”, UEES Conference, Miedzyzdroje ,1996;

- “*Studies on the Electro-Thermal Behaviour of the Metal-on-Metal Sliding Contacts in Railguns*” Polish-Japanese Seminar, Gdansk, 1997;
- “*Numerical Modelling of Magnetic Hysteresis in Electrical Engineering*” MIS Conference, Marlboro, 1998;
- “*Classification of Eddy Current NDT Data by Probabilistic Network*”, International Joint Conference on Neural Networks, Washington DC, 1999;
- “*Modelling of Ferromagnetic Hysteresis in Soft Magnetic Materials*” ISTET Conference, Warsaw, 2003;
- “*New Perspectives in Non-Destructive Electromagnetic Diagnostics*” International Compumag Newsletter, Vol. 11, N. 3, pp. 7-21, 2004;
- “*Vector Hysteresis Measurements via a Single Disk Tester*”, HMM’05 Conference, Budapest, 2005;
- “*Numerical Implementation of the Radial Vector Hysteresis Model*”, 14-th COMPUMAG Conference, Shen Yang, 2005;
- “*Phenomenological modelling of magnetic hysteresis*” International Compumag Newsletter, Vol. 17, N. 3, pp. 3-17, 2010;
- “*Phenomenological Modelling of Magnetic Materials*” HMM Conference 2015 Iasi.

In the two research laboratories: the Electrical Laboratory, in Perugia, and the Laboratory of Electromagnetic Characterization of Materials in Terni, founded and currently directed by Ermanno Cardelli are included systems that can measure electromagnetic fields, hysteresis cycles and magnetic losses from dc to 18 GHz, enabling to carry out relevant experimental studies.

Ermanno Cardelli has been scientific responsible or branch coordinator of the following Italian and international scientific programs:

- ITALIAN MINISTRY OF EDUCATION (MIUR) *Electromagnetic Compatibility in Complex systems* (1996-1998).
- CULTURAL EXCHANGES PROGRAMME OF THE ITALIAN MINISTRY OF EDUCATION (MIUR) partner: the George University of Washington (2000).
- ITALIAN MINISTRY OF EDUCATION (MIUR) - *Methods and Applications of Non Destructive Electromagnetic Diagnostics MADEND* (2005-2007).
- ITALIAN MINISTRY OF EDUCATION (MIUR) *Applications of Modelling of Diagnostics in Electromagnetics AMDE* (2007-2009).
- BILATERAL U.S. - ITALIAN SCIENTIFIC PROGRAMME: *Modeling of Magnetic Hysteresis* (2006-2008).

In addition he has been scientific responsible for the following environmental and industrial research programmes:

- UMBRIA REGIONAL GOVERNMENT: *Non Ionizing Radiation Assessment and Control* (1997-2001).
- ITALIAN ENVIRONMENT MINISTRY: *Realization of machines and measurement systems for the exposure to controlled electromagnetic field* (2001-2003).

And, from 1992 to date, he has been responsible of technical programmes for the design and the development of innovative products and manufacturing systems with the main following Companies :

- ABB
- ACCIAI SPECIALI TERNI
- AGENZIA SPAZIALE ITALIANA
- ALCATEL
- ANSALDO
- ISTITUTO NAZIONALE DI FISICA NUCLEARE INFN
- MERLIN GERIN
- OMA
- RAI WAY
- RTI – MEDIASET
- SCHNAIDER
- SELEX
- SOCIETA' DELLA FUCINE
- POWER ONE
- TRAFOMECC
- TRENITALIA
- UMBRA GROUP.