CURRICULUM
VITAE ET STUDIORUM

of

SILVIA COMANI

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Personal information and Education

Current position, official address, phone and fax numbers:

Associate Professor of Applied Physics, University "G. d'Annunzio", Chieti – Italy (http://www.unich.it)

Director, BIND – Behavioral Imaging and Neural Dynamics Center, University "G. d'Annunzio", Chieti – Italy (http://www.bindcenter.eu)

Head, Magnetocardiography Unit at the Institute of Advanced Biomedical Technologies (ITAB), University Foundation "G. d'Annunzio", Chieti - Italy

Scientific Consultant for Translational and Technological Innovation in Neuroscience at the private hospital "Casa di Cura Villa Serena", Città S. Angelo (PE) – Italy (http://www.villaserena.it/)

Reviewer of research projects (PRIN and FIR) for the Italian Ministry of Research.

Affiliated, Department of Neuroscience and Imaging, University "G. d'Annunzio", Chieti - Italy

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Date and place of birth: 1st June 1956, Parma, Italy

Nationality: ITALIAN

Education: Italian Degree of Doctor in Physics, 1979, University of Bologna (Italy) with the thesis "Problema dell'inizio di una glaciazione" on the physical problems related to the inception of glaciations.

Ph.D. in Physics, 1985, Catholic University of Louvain-la-Neuve (Belgium) with the thesis "Analysis of the Historical Series of Temperature and Precipitation at Bologna (1716-1774)" on the spatio-temporal analysis of climatic data at Bologna (Italy) in the context of the Italian and European climate in the XVIII century.

Languages: fluent written and spoken English and French

Career/Employment

2011 (July 16) **Selected candidate** (one of the six selected candidates out of the about 20 applicants) **for the position of Full Professor in Computational Neurosciences and Head of the Biomagnetic Center**, Department of Neurology at the University Hospital, Jena (Germany) (see invitation letter for the *lectio magistralis*)

2011 (Jan 07) **Offered an appointment as Associate Professor at the School of Biological and Health Systems Engineering (SBHSE) of the Ira A. Fulton Schools of Engineering, Arizona State University (USA) at the yearly salary of 110.000,00 USD** with a start-up support for research activities consisting in: 4 months of summer salary during the first 2 years of employment, support for 2 Ph.D. candidate graduate research associates for the first 2 years, 235.000,00 USD for laboratory equipment and supplies and 10.000,00 USD for travel funding for the first year of appointment, lab space of about 1500 as ft with offices.

2008 – present **Scientific Consultant for Translational and Technological Innovation in Neuroscience** at the private hospital "Casa di Cura Villa Serena", Città S. Angelo (PE) – Italy

2007 – present **Director, BIND** – Behavioral Imaging and Neural Dynamics Center (Chieti University - Italy)

2005– present **Associate Professor of Applied Physics** (School of Medicine and Faculty of Human Movement Sciences, Chieti University - Italy)

2000 – 2004 **Research Professor of Applied Physics** (School of Medicine, Chieti University - Italy)

1995 – present **Head of the Laboratory of Magnetocardiography** at the Institute of Advanced Biomedical Technologies (ITAB) - Chieti University - Italy

1994 – present affiliated to the Institute of Advanced Biomedical Technologies (ITAB) - Chieti University - Italy

1988 – 1999 Research Assistant (School of Medicine, Chieti University - Italy)

1986 – 1987 System Engineer and Seller Engineer for universities at IBM Italy SpA (Rome, Italy)

1982 – 1985 Ph.D. fellow in Physics, Catholic University of Louvain-la-Neuve (Belgium)

1980 – 1986 Research contracts with the "Institute for the Study of the Physical and Chemical phenomena at the high and low Atmosphere" of the Italian National Research Council, with the Bologna University and the Region Emilia Romagna (Italy)

University Committees

2013 - present	**Member of the Curriculum Committee** of the Master of Science Course in Human Movement Sciences, Chieti University – Italy
2005 - 2006	Representative for the Faculty of Human Movement Sciences at the **University Committee for Linguistic Studies**, Chieti University – Italy
2003 – 2007	Representative of the Faculty of Human Movement Sciences at the **University Committee for E-learning**, Chieti University - Italy
2002 - 2005	Member of the **Committee for student Curricula** at the Faculty of Human Movement Sciences, Chieti University - Italy
2002 - 2005	Member of the **Committee for Information, Communication and Technology (ICT)** at the Faculty of Human Movement Sciences, Chieti University - Italy
2001	Member of the **Supervisory Committee** for the studies on Human Movement Sciences at the School of Medicine, Chieti University - Italy

Organizational activity

Nov 2010	**co-organizer and invited speaker** at the First International Workshop "Fetal Magnetocardiography", MEG-Center, University of Tubingen (Germany) 22-23 Nov 2010 with the talk "fMCG signal processing with Independent Componenet Analysis"
Oct 2010	**member of the Scientific Committe** at the XVIII National Congress of the Italian Association of Sport Psychology, University of Chieti (Italy) 16-17 Oct 2010
April 2009	**Organizer** and **General Chair** of the **1st International Workshop "Perinatal Biomagnetism 2009: how can it help sick fetus/infant?"**, Chieti - Italy (http://pb2009.udanet.it). Purpose of the workshop was to provide obstetricians, perinatologists, pediatricians, pediatric neurologists and pediatric cardiologists, who might be interested in new technologies in translational Perinatal Medicine, with an updated overview of the state-of-the-art in the application of Magnetocardiography (MCG) and Magnetoencephalography (MEG) in the specific field of fetal and neonatal medicine. Particular emphasis was devoted to compare the prospective suitability of MCG and MEG in Perinatal Medicine with that of techniques routinely used in the clinical setting, such as ultrasound or ECG/EEG.
August 2008	**Organizer, chair-person** and **speaker**, workshop **"Recent advances in fetal Magnetocardiography"**, organized within the 16th

	International Conference on Biomagnetism (**Biomag 2008**), Ryoton (Sapporo - Japan)
Sept 2006	**Member of the Scientific Committee**, 17th International Meeting of the International Society for Brain Electromagnetic Topography (**ISBET 2006**) – Chieti (Italy)
2005 - 2007	**Responsible for funding**, **European Task Force for the clinical application of Magnetocardiography**
Sept 2003	**Member of the Scientific Committee**, 4th International Symposium on Noninvasive Functional Source Imaging within the human brain and heart" (**NFSI2003**), Chieti - Italy

Leadership and administrative skills

Since the beginning of her research activity in historical climatology in 1980, Silvia Comani has been trained to perform collaborative activity with researchers in fields other than physics, such as mathematics, history and geology.

Since 1989, when she started her work in biomedical research, Silvia Comani has been involved in multidisciplinary research projects that were performed by physicists, cardiologists and neurologists in the field of Biomagnetism.

Since 1995, when she became the head of the Laboratory of Magnetocardiography at the Institute of Advanced Biomedical Technologies (Chieti University, Italy), Silvia Comani has developed good skills in performing and leading collaborative research work with people having very different scientific background, such as physics, engineering, electro-physiology, pediatric cardiology, gynaecology, psychology, kinesiology, neurology, psychiatry and neuroscience. During those years, Silvia Comani has also developed very good skills in establishing successful collaborative research at an international level.

From 2006 until 2009, Silvia Comani was the coordinator of an international project (INTERLINK Project n.II04CD8G5A "New methods to reconstruct and analyze the fetal cardiac signals recorded by magnetocardiography") with two foreign partners: the University of San Paolo at Ribeirao Preto (Brazil) and the University of Wisconsin at Madison (USA). Participants into the project were physicists, biomedical engineers and pediatric cardiologists. During that period, Silvia Comani has refined her skills in coordinating the scientific activity of research groups geographically very dispersed. She was responsible for the administration of the funds received by the Italian Ministry of Research to perform this project, and therefore she had an opportunity to improve also her administrative skills.

Since 2007, when she was named director of the BIND – Behavioral Imaging and Neural Dynamics Center (Chieti University – Italy), Silvia Comani has advanced her ability in the administration of a research center as well as her skills as leader of a multidisciplinary research group. Indeed, the members of the BIND Center have very diverse expertise, spanning from applied physics, signal processing and non linear dynamics, to motor behavior, sport psychology, neuropsychology and cognitive neuroscience. In a very short time span, Silvia Comani has guided the researchers of the BIND Center to start several scientific projects in collaboration with Italian and foreign research centers. Those project use different functional imaging techniques (MCG, MEG, fMRI and EEG), regard both non-clinical and clinical populations, and range from the nonlinear characterization and categorization of physiological signals, the development of scientific instrumentation for neuro-behavioral studies, the study of the neural correlates of coordination in adults and prehension in infants (Mu-rhythm), to studies on the neural correlates of good performance in elite athletes, neurocognitive studies on the representation of space and action using a Virtual Reality environment,

and the study of neural function plasticity in neuro-motor rehabilitation performed with a haptic device working in a Virtual Reality environment.

Since 2008, Silvia Comani, as scientific Consultant for Translational and Technological Innovation in Neuroscience, also coordinates the research projects developed in collaboration with the private hospital "Casa di Cura Villa Serena", Città S. Angelo (PE) – Italy.

Finally, in 2013 Silvia Comani has received a European grant (€ 1.595.310,46) as coordinator of the European Project ANDREA (project n° 610950) "Active Nanocoated DRy-electrode for Eeg Applications" (Call identifier FP7-PEOPLE-2013-IAPP). This project will have a duration of 4 years (until December 2017) and will be performed in collaboration with the University of Ilmenau (Germany), the University of Porto (Portugal), the company eemagine Medical Imaging Solutions GmbH, Berlin (Germany), and the private hospital Casa di Cura Villa Serena, Città S.Angelo (Italy) to develop a new dry-electrode EEG system with automatic mounting system. Silvia Comani will be responsible for supervising and coordinating all scientific and administrative aspects of the project.

Research activity

Main fields

- Biomedical signal processing with particular attention to novel techniques such as Independent Component Analysis (ICA) and ICA-based analytical methods, linear and nonlinear methods to analyze functional signals, Graph Theory, methods for the evaluation of functional and effective connectivity in the adult and infant brain (Granger causality).
- Application of bioelectric and biomagnetic methods and tools in basic and clinical studies in cardiology, fetal cardiology, neurodevelopment in neonates, infants, children, adults and elderly people, cognitive processes in movement and action, coordination dynamics, behavior dynamics, neuro-motor rehabilitation.

Current research interests

- Biomagnetism in Perinatal Medicine
- Functional early human development
- Functional imaging of the neural basis of motor development, learning, control and rehabilitation in clinical and non clinical populations
- Application of linear and nonlinear methods for the quantification of functional and effective connectivity in the developing human brain and in clinical populations under neuro-motor rehabilitation
- Functional imaging and application of linear and nonlinear methods for the understanding of the neuro-physiological basis of fatigue

Description of the research activity

During her entire scientific career, Silvia Comani has been working in signal processing, applying linear and non linear analysis methods to very different types of signals, spanning from meteorological to biomedical signals. Her research activity has always been devoted to the application of signal processing techniques in diverse research fields. Therefore, **Silvia Comani has developed good skills in collaborative work with researchers from different specialties and different scientific background**, such as mathematics, geography, history, biology, cardiology, neurology, psychology, psychiatry and kinesiology.

From 1980 until 1986 Silvia Comani has worked in the field of **Historical Climatology**, with main focus on the reconstruction and analysis of climatic data recorded during the XVIII century in Florence, Bologna and Padua. The climatic information was retrieved from codes written in Latin. Temporal series of temperature

and pressure required the conversion to modern units of measurement through the reconstruction of ancient thermometric and pressure scales, and other meteorological data was retrieved from phenomenological data (such as crop production), which is, in general, qualitative information that needs to be coded and quantified in order to be analyzed with mathematical methods.

In **1987** Silvia Comani starts working in the **analysis of biomedical data**. Initially, Silvia Comani collaborated with the Institute of Normal Human Anatomy (Bologna University, Italy) to analyze data on *Natural Killer cells* (NK) obtained with *scattering* methods to estimate the cyto-toxic activity of single cells.

In 1988, Silvia Comani starts working at the **clinical application of Biomagnetism.**

From 1988 to 1994, Silvia Comani actively contributes to the following studies, working at the design of the experimental setup, performing Biomagnetic data acquisition and analysis:

1) **Normative study for the evaluation of the risk for sudden cardiac death due to arrhythmia**; biomagnetic maps of the cardiac activity were analyzed and the results were compared with data obtained with routine ECG.
2) **Comparative study of risk factors between non clinical and clinical populations with myocardial dysfunctions**; this study was performed on patients affected by repolarization dysfunction of the left ventricle and by cardiac hypertrophy.
3) **Dynamic magnetocardiography in athlete populations**; this study aimed at identifying cardiac dysfunction under stress in athletes through the detection of morphology modifications in the magnetocardiogram (MCG). The stress test during biomagnetic acquisitions was performed using an apparatus built with the purpose of avoiding any interference with the magnetic measurements. Its setup allowed the athlete to reach high levels of stress during MCG acquisitions.
4) **Assessment of the segmented gastro-intestinal transit times**; this study aimed at assessing a non-invasive method to determine the segmented gastro-intestinal transit times in patients at radiological risk, such as children and pregnant women. New magnetic markers were built and used for this study. Magnetic filed maps were compared with aligned MRI structural images to determine the positions of the markers inside the bowel and the associated segmented gastro-intestinal transit times.
5) **Assessment of the spontaneous gastric activity**; this study aimed at validating a non-invasive biomagnetic method for the assessment of gastric activity with respect to classical methods, such as electrical, manometric and endoscopic techniques, which are invasive. Rare myoelectric activity, such as the Migrating Motor Complexes, was identified. Biomagnetic data was analyzed using a statistical approach and neural networks.
6) **Haematic flux modelling by means of a paramagnetic marker**; this study

aimed at assessing blood flow velocity by means of a paramagnetic tracer. This method showed to be particularly effective for the online non-invasive monitoring of blood flow in the venous system.

In the same period, Silvia Comani participated in other studies related to the biomagnetic measurement of **human tissue susceptibility** and of the **evoked cortical activity**, with the identification of its main components and corresponding neuronal groups.

Since 1994, Silvia Comani becomes **principal investigator** of several studies:

1) **Assessment of magnetocardiographic parameters for the early diagnosis of cardiac hypertrophy**. Biomagnetic map analysis and cardiological parameters were combined to differentiate between patients affected by left ventricle hypertrophy secondary to hypertension and non-clinical subjects.
2) **Biomagnetic study of patients affected by left ventricle re-modelling secondary to hypertension**. This clinical population is at major risk for developing left ventricle hypertrophy, and the diagnostic power of some magnetocardiographic parameters, derived by the conjoint analysis of biomagnetic maps and early–stage morphological modifications, was verified vs. non significant variations of electrocardiographic and echocardiographic indexes.
3) **Development of methods for the localization of sources of myocardial activity signals**. This study was performed in conjunction with the previous one, and aimed at assessing a method for the detection of the source of myocardial activity throughout the cardiac cycle. Models for the human thorax and heart, and for the signal source were developed, and the localization technique was assessed vs. anatomical localization of the cardiac structures as visualized by means of MRI monitoring.

Since 2000, Silvia Comani has been working in **Fetal Magnetocardiography (fMCG)**, which becomes one of her most important research lines. The clinical usefulness of fMCG mainly depends on the availability of good methods to separate the fetal cardiac signal from the mixed signals recorded with a multi-channel MCG system. **Silvia Comani was the first to apply Independent Component Analysis (ICA) to the processing of fMCG data for the reconstruction of noise-free fetal cardiac signals from fMCG recordings acquired also at very early gestation**. The fMCG data used was acquired with the MCG system installed in Chieti (ATB Argos 200, 55-channel system), but also with other systems available at other centers of Biomagnetism in Europe and in USA.

Within this area of research, Silvia Comani was the **principal investigator** of several studies:

1) **Development of methods to separate the fetal cardiac signal from MCG data recorded with different multi-channel systems in shielded and unshielded**

environment (55–channel and 36-channel biomagnetic systems, Chieti and Rome - Italy). **Independent Component Analysis (ICA)** was applied to fMCG data for the first time to obtain fetal cardiac signals with clear morphology and correct timing also during early gestation. ICA performances were compared with those of other methods and generally outperformed them not only in the analysis of data recorded in a magnetically shielded room, but mainly in the analysis of data recorded in an unshielded environment.

2) **Separation of fetal cardiac signals from twin pregnancy MCG data** (55–channel system, Chieti - Italy). The usefulness of ICA to separate reliable fetal cardiac signal was tested in twin pregnancy. ICA was successful for fMCG data recorded during the third trimester of gestation, and the localization of signal source was consistent with simultaneous echocardiographic information.
3) **Normative study to determine reference fetal cardiac time intervals** (55–channel system, Chieti - Italy). This longitudinal study aimed at calculating reference fetal cardiac time intervals on a beat-to-beat basis using reliable and good quality fetal cardiac signals separated with ICA. The outcome of the study was compared with reference values obtained on averaged fetal heartbeats, as usually done with other systems to improve the signal-to-noise ratio of the fetal cardiac signals.
4) **Development of an automatic system for the calculation of fetal cardiac time intervals from fMCG** (55 –channel system, Chieti - Italy). This system was developed to speed up the process of calculating the fetal cardiac time intervals on a beat-to-beat basis, which may be a long-lasting procedure if performed manually. This automatic system was based on the automatic determination of the onset and endpoints of the cardiac waves (P, QRS, T).
5) **Characterization of fetal arrhythmias from fetal magnetocardiograms** (55–channel system, Chieti - Italy). Methods to analyzed the fetal magnetocardiograms in the time and frequency domains were developed.
6) **Reconstruction of magnetic maps from ICA separated fetal magnetocardiograms** (55–channel system, Chieti – Italy). The application of ICA to separate the fetal signals has the limit of providing only one trace out of multiple recordings. A method to interpolate and re-project the separated fetal signal onto the sensor plane was developed to allow for magnetic maps reconstruction and analysis.
7) **Filtering methods for fetal cardiac signal enhancement** (55–channel system, Chieti – Italy). Different band-pass filters and smoothing algorithms were compared in order to assess the best pre-processing setup for fetal magnetocardiograms.
8) **Development of a SW platform for fMCG data handling and analysis**. In the perspective of bringing fMCG in the clinical practice, a SW platform was developed to allow operators not skilled in fMCG data analysis to process fMCG data recorded with different multi-channel systems having different number of sensors and different technical features.

In 2005, the article **"Time course reconstruction of fetal cardiac signals from fMCG: independent component analysis versus adaptive maternal beat subtraction**", published by Silvia Comani et al. in *Physiological Measurement* (2004), 25(5):1305-1321, **was nominated by the Publishing team of *Physiological Measurement* for inclusion in the Highlights 2004**. The same article **was among the top 30 most highly downloaded articles in the journal during the year 2005**. To put this into context, across all IOP journals 3% of articles were accessed over 500 times in 2005.

Since 2006 Silvia Comani has established several **international scientific collaborations** in the field of **fetal magnetocardiographic signal processing**, as listed below:

1) **Department of Medical Physics, Wisconsin University at Madison, Wisconsin – USA** (Prof. Ronald T. Wakai) and **Wisconsin Children's Hospital, Fox Valley – USA** (Prof. Janette Strasburger), for the application of different ICA algorithms to separate fetal cardiac signals in multiple pregnancy fMCG data recorded in Chieti (Italy) and Madison (USA). Moreover, different techniques to separate the fetal cardiac signals were compared.
2) **Laboratory of Computational Neuro-engineering**, Dept. of Radiology, **California State University at San Francisco**, California – USA (Dr. Kenneth E. Hild II and Prof. Srikantan S. Nagarajan), to quantify the performances of different ICA algorithms for the extraction of the fetal signal from fetal magnetocardiograms.
3) **Fetal Magnetoencephalography Laboratory, University of Arkansas** in Little Rock – USA (Dr. Hubert Preissl e Dr. Hari Eswaran) to compare the performance of ICA with that of Project Operator (PO). FMCG data recorded with two different systems (ATB Argos 200, Chieti - Italy, and SARA system, Little Rock, Arkansas - USA) were used for this study.
4) **Department of Physics, Facultade de Filosofia, Ciências e Letras de Riberão Preto, Universidade de São Paulo – Brazil** (Prof. Oswaldo Baffa, Prof. Draulio de Araujo, Prof. Eder Rezende Moraes, Prof. Luiz Otavio Murta) for the following studies:
    a) the identification of linear and nonlinear parameters suitable to characterize the fetal cardiac function and fetal states;
    b) the development of a new segmented ICA algorithm for the separation of higher SNR fetal cardiac signals from fetal magnetocardiograms affected by non-stationarity;
    c) the development of a new SW platform for the analysis of fMCG data that includes linear and nonlinear processing tools.
5) **Department of Biomagnetism, Faculty of Medicine, University of Witten Herdecke, Bochum** – Germany (Prof. Peter van Leeuwen), to compare the performance of ICA, that is based on the spatial distribution of the fetal magnetocardiograms, with the performance of the template matching technique (TMT), which is based on the temporal analysis of fMCG data. FMCG data

recorded with two different systems (ATB Argos 200, Chieti - Italy, and 4D Neuroimaging Magnes 1330C, Bochum - Germany) were used for this study.

During the same period, Silvia Comani has collaborated with Prof. Francesco Di Salle (**Department of Neurological Sciences**, University Federico II, Naples – Italy) on the application of ICA to the processing of fMRI data, and with Prof. Allan Kardec Barros (**PIB-Laboratory for Biological Information Processing, Federal Univ. Maranhão, São Luís** – Brazil) for the application of ICA to the processing of adult ECG data and its compression for telemedicine purposes.

In 2007, Silvia Comani and some colleagues from the Faculty of Human Movement Science (University "G. d'Annunzio", Chieti – Italy) founded the inter-Faculty research center **BIND – Behavioral Imaging and Neural Dynamics Center**, (http://www.bindcenter.eu). **Silvia Comani was nominated Director of the BIND Center, and, under her guidance, several new research projects and scientific collaborations were established.**

The research projects relate to the **nonlinear characterization of fetal cardiac signals** separated with ICA from fMCG recordings, and to the **detection and analysis of the neural correlates of specific movements and inter-limb coordination in humans (non-clinical and clinical subjects) with the use of fMRI, MEG and EEG systems in conjunction with new systems for movement guidance and monitoring (Haptic Devices) and environment manipulation (Virtual Reality) as well as new psychological approaches**.

More recently, Silvia Comani focused on the application of **methods for the assessment of the functional and effective connectivity (such as Granger causality and Graph Theory) in the developing and adult human brain in different populations** (typically developing infants and children, athletes, patients affected by various neurological diseases and stroke survivors).

Some of these projects (some still in progress) are performed in collaboration with Italian and foreign research centers, as listed below:

1) **Development of a non-magnetic equipment for the high spatio-temporal resolution monitoring of finger kinematics in bimanual coordination tasks**. We developed and validated a new equipment for the acquisition of kinematic information on finger movements during functional brain monitoring performed with fMRI, MEG or EEG. (completed)

2) **Neural correlates of different bimanual coordination patterns in tasks that imply spontaneous or intentional switching.** These studies were performed using the equipment mentioned above. The study on the neural correlates of intentional switching during bimanual coordination was performed in collaboration with the **Center for Complex Systems and Brain Sciences, Florida Atlantic University - Boca Raton (FL - USA)** (Prof. JAS Kelso)**,**

where 3T fMRI data were collected together with kinematic data, and replicated in collaboration with the **Human Cognition and Neural Dynamics Laboratory, Western Washington University - Bellingham (Washington – USA)** (Prof. KJ Jantzen), where HR-EEG data were collected together with kinematic data. (completed)

3) **Longitudinal study of the functional response (Mu-rhythm) to prehension in children from 1-month-old to 6-years-old**. This study, still in progress, is performed in collaboration with the **Biomedical Research and Integrative NeuroImaging (BRaIN Imaging) Center, Health Sciences Center, University of New Mexico, Albuquerque – USA** (Prof. Yoshio Okada e Dr. Julia Stevens), where the functional data were acquired with the pediatric MEG system available there (Baby-SQUID). Psycho-motor development in infants is also evaluated with dedicated tests. (completed)

4) **Bio-psycho-social states in elite shooters**. The purpose of this study was to combine psychological (emotion, bodily states), physiological (EEG, EOG, HR, GSR, RF) and neural (EEG) data, and to correlate them with the performance of elite shooters. This study was performed in collaboration with the **Federazione Italiana Pentathlon Moderno - Italy** (FIPM), the **Unione Italiana Tiro a Segno - Italy** (UITS), the **NeuroLab, Institute of Sport Sciences (CONI)**, the **Department of Human Physiology and Pharmacology, University "La Sapienza", Rome - Italy** (Prof. Fabrizio Eusebi) and the **Department of Biomedical Sciences, University of Foggia - Italy** (Prof. Claudio Babiloni). (completed)

5) **Perspective taking in schizophrenic patients and non clinical subjects with a high degree of schizotypy in self-rotation tasks using a Virtual Reality (VR) environment**. The purpose of this study is to: i) use VR environments to explore the deficit in allocentric simulation shown by schizophrenic patients and in subjects with a high degree of schizotypy, and ii) evaluate, by means of HR-EEG, the cortical activity related to egocentric and allocentric space representations in those two populations. The identification of altered perspective taking patterns and of their neural correlates, together with an evaluation of the effectiveness of a VR environment, might help the definition of new meta-cognitive interventions in schizophrenic patients. This study, in progress, is performed in collaboration with the private hospital "**Casa di Cura Villa Serena", Città S. Angelo (PE) – Italy** (Prof. Alessandro Rossi, Dr. Biancamaria Guarnieri), where schizophrenic patients and non clinical subjects with a high degree of shizotypy will be enrolled and treated. (ongoing)

6) **Use of Virtual Reality and Haptic Device for the neuro-motor rehabilitation of ischemic stroke patients**. The purpose of this study is to evaluate the effectiveness of a haptic device working in combination with VR environments for the neuro-motor rehabilitation of upper limbs in stroke survivors (both acute and chronic patients). The recovery of motor and neural functions and brain functional plasticity will be monitored with dedicated tests and HR-EEG. This

study, at its initial stages, is performed in collaboration with the **PERCRO Lab, Scuola Superiore Sant'Anna, University of Pisa – Italy** (Prof. Massimo Bergamasco and Dott. Antonio Frisoli) and the private hospital **"Casa di Cura Villa Serena", Città S. Angelo (PE) – Italy** (Prof. Sandro Sorbi, Dr. Biancamaria Guarnieri), where stroke survivors will be enrolled and treated. (ongoing)

7) **Development of an automatic system for the categorization of patients affected by Coronary Artery Disease (CAD)**. This system is based on the nonlinear information contained in the MCG traces recorded in patients affected by *angina pectoris* but not necessarily showing a manifest narrowing of the coronary arteries. The aim of this study is to support an early diagnosis of Coronary Artery Disease (CAD). This study, still in progress, is performed in collaboration with the **Institute of Biomedical Engineering and Informatics at the Technical University Ilmenau, Germany** (Prof. Jens Haueisen) and with the **Department of Biomagnetism, Faculty of Medicine, University of Witten Herdecke, Bochum – Germany** (Prof. Peter van Leeuwen), where the MCG patient data were collected. (completed)

8) **Study of the neural correlates and direction of information flow in the brain in muscle fatigue** in different populations, such as athletes, soldiers, patients affected by the chronic fatigue syndrome. This study is performed using EMG and EEG data that are analyzed using time-frequency analysis, coherence analysis, Granger causality and other advanced signal processing techniques, in collaboration with the **Centre for Sports Studies**, **University of Kent**, **UK** (Prof. Samuele Marcora). (ongoing)

9) **Quantification of electrophysiological markers of early human brain development**. This study is performed on a population of infants (2-12 months) and children (2-5 years) by means of time-frequency analysis and non linear methods to identify the features of functional connectivity patterns over the range of frequencies typical of μ rhythm in the study populations, as assessed in a previous study by Prof. Comani and her students. Indices derived by the Graph Theory are calculated and evaluated as indicators of the developmental brain stage. (ongoing)

10) **Detection of differences in the default mode network (DMN) in neurological patients** (patients affected by Alzheimer Disease (AD), patients affected by Dementia with Lewy Bodies (DLB) and characterized by fluctuating cognition). This study is performed in collaboration with the **Aging Research Centre of the "G. d'Annunzio" University Foundation of the University of Chieti** (Prof. Marco Onofrj), and aims at using the Granger causality analysis to identify differences in the effective connectivity of the resting state network of these patients as compared to non clinical subjects. (completed)

11) **ERD/ERS patterns of shooting performance within the multi-action plan model**. The purpose of this study, performed within the **BIND Center (UdA)**, is

to test the cortical patterns correlated to the performance categories conceptualized within the multi-action plan (MAP) model, which reflects the notion that different psychophysiological states underlie distinct performance-related experiences. (ongoing)

12) **ERD/ERS patterns in endurance cycling within the multi-action plan model**. The purpose of this study, performed within the **BIND Center (UdA)**, is to test the ERD/ERS patterns associated with the performance categories conceptualized within the multi-action plan (MAP) model, which reflects the notion that different psychophysiological states underlie distinct performance-related experiences. (ongoing)

13) **Quantification of functional and effective connectivity during endurance training in cyclists**. This study aims at testing the efficacy of different attention-based strategies derived from the MAP model to improve performance in endurance activity, and to verify whether specific cortical functional networks, and effective connectivity patterns, are associated with the different types of performance foreseen in the MAP model. This study is performed **in collaboration with the Engineering Department of Roma3 University in Rome** (Italy) (Prof. Silvia Conforto), and aims at using coherence analysis and Graph Theory for quantifying brain functional connectivity and efficiency during task performance in different conditions. (ongoing)

14) **Quantification of the muscular fatigue by means of an EMG bi-dimensional parameter**. The aim of this study is to introduce a new parameter for fatigue investigations, which relies on a bidimensional analysis of sEMG signals in temporal and spectral domains. The new parameter, the Fatigue Vector, is defined in a space domain whose coordinates are the amplitude and the mean spectral frequency of the sEMG signal. This study is performed **in collaboration with the Engineering Department of Roma3 University in Rome** (Italy) (Prof. Silvia Conforto). (ongoing)

15) **Determination of a neural minimum input model to reconstruct the electrical cortical activity**. In the present study we determined whether the amount of information derived from a standard 19 channel EEG recording can be obtained using a smaller number of electrodes, in particular with a mounting of only 8 channels. This study is performed **in collaboration with the Engineering Department of Roma3 University in Rome** (Italy) (Prof. Silvia Conforto). (ongoing).

16) **Hyperbrain connectivity during cooperative motor tasks**. In this study we aim at detecting the functional connections active during cooperative tasks in juggling dyads within the theoretical framework of social minds. We will use various functional approaches and the Graph Theory concepts to explore this phenomenon. (ongoing).

Scientific collaborations

2014 – present	Mechanical Engineering Research Center, Universidade do Porto, Porto, Portugal (Prof. Carlos Fonseca)
2011 – present	ANT-Neuro, Enschede, Netherlands (Dr. Frank Zanow, PhD, CEO)
2011 – present	eemagine Medical Imaging Solutions GmbH, Berlin, Germany (Dr. Ralf Hauffe, PhD, CEO)
2011 – present	Centre for Sports Studies, University of Kent at Medway, United Kingdom (Prof. Samuele Marcora, kinesiologist)
2011 – present	Dept. of Applied Electronics, Faculty of Engineering, University Roma3, Roma, Italy (Prof. Silvia Conforto)
2010 – present	School of Biological and Health Systems Engineering, Ira A. Fulton Schools of Engineering, Arizona State University, USA (Prof. Marco Santello, kinesiologist)
2009 – present	Institute of Biomedical Engineering and Informatics at the Technical University Ilmenau, Germany (Prof. Jens Haueisen, biomedical engineer)
2008 – present	private hospital "Casa di Cura Villa Serena", Città S. Angelo (PE) – Italy (Prof. Sandro Sorbi, neurologist, Prof. Alessandro Rossi, psychiatrist, Dr. Biancamaria Guarnieri, neurologist)
2007 – present	PERCRO Lab, Scuola Superiore Sant'Anna, University of Pisa – Italy (Prof. Massimo Bergamasco, engineer, and Dott. Antonio Frisoli, engineer)
2007 – present	Department of Physics, University of Parma – Italy (Dr. Maria Teresa Di Bari, physicist)
2007 – present	Department of Biomedical Sciences, Foggia University – Italy (Prof. Claudio Babiloni, physiologist)
2007 – 2010	Human Cognition and Neural Dynamics Laboratory, Western Washington University - Bellingham (Washington – USA) (Prof. KJ Jantzen, psychologist)
2007 – 2008	Department of Human Physiology and Pharmacology, University "La Sapienza", Rome - Italy (Prof. Fabrizio Eusebi, sport physician and physiologist)
2006 – present	MEG-Center, University of Tübingen - Germany (Dr. Hubert Preissl, physicist)
2006 – present	Biomedical Research and Integrative NeuroImaging (BRaIN Imaging) Center, Health Sciences Center, University of New Mexico, Albuquerque – USA (Prof. Yoshio Okada, neuroscientist, and Dr. Julia Stevens, physicist)

2006 – present	Department of Biomagnetism, Faculty of Medicine, University of Witten Herdecke, Bochum – Germany (Prof. Peter van Leeuwen, mathematician and electro-physiologist)
2006 – present	Department of Medical Physics, Wisconsin University at Madison, Wisconsin – USA (Prof. Ronald T. Wakai, physicist)
2006 – present	Wisconsin Children's Hospital, Fox Valley – USA (Prof. Janette Strasburger, pediatric cardiologist)
2006 – present	Department of Physics, Facultade de Filosofia, Ciências e Letras de Riberão Preto, Universidade de São Paulo – Brazil (Prof. Oswaldo Baffa, physicist, Prof. Draulio de Araujo, physicist, Prof. Eder Rezende Moraes, physicist, Prof. Luiz Otavio Murta, physicist)
2006 – 2010	Center for Complex Systems and Brain Sciences, Florida Atlantic University - Boca Raton (FL - USA) (Prof. JAS Kelso, neuroscientist)
2006 – 2010	PIB-Laboratory for Biological Information Processing, Federal Univ. Maranhão, São Luís – Brazil (Prof. Allan Kardec Barros, electronic engineer)
2006 – 2007	Fetal Magnetoencephalography Laboratory, University of Arkansas in Little Rock – USA (Dr. Hubert Preissl, physicist, and Dr. Hari Eswaran, physicist)
2006 – 2007	Laboratory of Computational Neuro-engineering, Dept. of Radiology, California State University at San Francisco, California – USA (Prof. Srikantan S. Nagarajan, engineer, and Dr. Kenneth E. Hild II, engineer)
2004 – 2006	Department of Neurological Sciences, University Federico II, Naples – Italy (Prof. Francesco Di Salle, neuro-radiologist)
2000 – 2004	Dept. of Electronics, Artificial Intelligence and Telecommunication, Polytechnical Marche University, Ancona (Italy) (Prof. Giovanni Cancellieri, electronic engineer)
1994 – 2005	Biomagnetism Center, Catholic University of the Sacred Heart, Rome (Italy) (Prof. Riccardo Fenici, electro-physiologist)
1994 – 1996	Zentralinstitut für Biomedizinische Technik, Ulm Universität, Ulm (Germany) (Dr. Sergio Nicola Erné, physicist)
1990 – 1993	Pediatric Clinic, Freie Universität, Berlin (Germany) (Prof. Konrad Brockmeier, pediatric cardiologist)
1990 – 1993	Physikalisch-Technische Bundesanstalt, Berlin (Germany) (Dr. Sergio Nicola Erné, physicist)

Research related activity

January 2014 **speaker** at the 23rd ANT Burgundy Neuromeeting, Beaune, France, 29 January - 1 February 2014, with the talks "Cortical efficiency and attentional focus in endurance cycling" and "Interactive brains in juggling dyads: a hyperbrain case study".

Sept 2013 **presenter** at the XIII Mediterranean Conference on Medical and Biological Engineering and Computing - MEDICON 2013, Sevilla (Spain), 25-28 September 2013, with the posters "Attentional Focus and Functional Connectivity in Cycling: An EEG Case Study" and "ERD/ERS Patterns of Shooting Performance within the Multi-Action Plan Model".

August 2013 **invited speaker** at the 18th National Congress of Medical Physics of Brazil, Sao Pedro (San Paulo – Brazil), 12-16 August 2013. with the talk "Combining a passive robotic device, virtual reality and high-resolution EEG for the neuro-motor rehabilitation of post-stroke patients".

January 2013 **speaker** at the 22nd ANT Burgundy Neuromeeting, Beaune, France, 23-26 January 2013, with the talk "Combining a passive robotic device, virtual reality and high-resolution EEG for post-stroke neuro-motor rehabilitation".

August 2012 **invited speaker** at the 18th International Conference on Biomagnetism, Symposium on "Novel Developments in Magnetocardiography" with the talk "Automatic classification of Coronary Artery Disease patients based on MCG signal entropy", Paris (France).

January 2012 **speaker** at the 21st ANT Burgundy Neuromeeting, Beaune, France, 25-28 January 2012 with the talks "Electrophysiological markers of early human brain development: dependence of mu-rhythm desynchronization on age" and "Virtual reality and perspective taking in adults with schizophrenia".

June 2011 **invited speaker** at the 2nd International Workshop "Perinatal Biomagnetism 2011: how can it help the sick fetus/infant?", 3-4 June, Jena (Germany) with the talk "Signal analysis in fetal magnetocardiography"

Nov 2010 **co-organizer and invited speaker** at the First International Workshop "Fetal Magnetocardiography", MEG-Center, University of Tubingen (Germany) 22-23 Nov 2010 with the talk "fMCG signal processing with Independent Componenet Analysis"

Nov 2010 Autumn School "Analyse the Brain", MEG-Center, University of Tubingen (Germany) 24-25 Nov 2010

Nov 2010 MEG Conference "Lifelong Imaging", MEG-Center, University of Tubingen (Germany) 25-27 Nov 2010

October 2010	**member of the Scientific Committee** of the 18th National Congress of the Italian Association of Sport Psychology "Psicologia dello sport e dell'esercizio tra prestazione e benessere", Chieti (Italy)
March 2010	**invited speaker** at the 17th International Conference on Biomagnetism, Symposium on "Biomagnetism in fetal and reproductive medicine: Applications and Modelling" with the talk "Fetal magnetocardiographic data processing", Dubrovnik (Croatia).
Sept 2009	Autumn School "Wiring the Brain: Anatomical and Functional Connectivity", Tubingen (Germany)
Sept 2009	11th International Congress on Medical Physics and Biomedical Engineering, Munich (Germany)
April 2009	**organizer** and **General Chair** of the 1st International Workshop "Perinatal Biomagnetism 2009: how can it help sick fetus/infant?", Chieti (Italy)
August 2008	16th International Conference on Biomagnetism, **organizer, chair-person** and **speaker** of the workshop "Recent advances in fetal Magnetocardiography", Ryoton (Sapporo - Japan)
Apr.-May 2008	NCM 2008, 18th Annual Meeting of Neural Control of Movement, Naples (Florida – USA)
April 2008	ESGCO 2008 - 5th International Conference on the European Study Group on Cardiovascular Oscillations, Parma (Italy)
Sept. 2007	**invited speaker** at the BMT 2007 - Annual Meeting of the German Society for Biomedical Engineering, Aachen (Germany), with the talk "Effectiveness of ICA processing for feature extraction in magnetocardiographic signals"
June 2007	HBM 2007 - 13th Annual Meeting of the Organization for Human Brain Mapping, Chicago (Illinois – USA)
February 2007	International Conference CD2007, Coordination: Neural, Behavioral and Social Dynamics, Boca Raton (Florida – USA)
Sept. 2006	17th International Meeting of the International Society for Brain Electromagnetic Topography ISBET – Chieti (Italy)
August 2006	**invited speaker** at the 15th International Conference on Biomagnetism, Symposium on Fetal Magnetocardiography, Vancouver (Canada), with the talk "Comparison of the performances of various Independent Component Analysis algorithms for fetal signal reconstruction from real FMCG datasets"
June 2006	**invited speaker** at the 11th National Congress of Medical Physics of Brazil, Riberao Preto (San Paulo – Brazil), with the talk "Fetal magnetocardiography"
Nov. 2005	**speaker** at the 3rd European Medical & Biological Engineering Conference EMBEC'05 and at the European Conference on Biomedical Engineering IFMBE, Prague (Czech Republic)

August 2004	**speaker** at the 14th International Conference on Biomagnetism, Boston (USA)
Sept. 2003	**speaker** and **chair-person** at the 4th International Symposium on Noninvasive Functional Source Imaging within the human brain and heart (NFSI2003), a Chieti (Italy)
May 2003	**speaker** at the 1st Meeting of Complex Systems and Sports (COM&COM) a Barcelona (Spain)
March 2003	**speaker** at the 2nd European *Congress of Radiology* (ECR 2003), Vienna (Austria)
Dec. 2002	**speaker** at the 2nd European Medical & Biological Engineering Conference EMBEC'02, Vienna (Austria)
August 2002	13th International Conference on Biomagnetism, Jena, Germany
May 2002	**speaker** at the 40th National Congress of the Italian Society of Medical Radiology, Rimini (Italy)
April 2002	**speaker** at the National Congress MIUR/CNR-ENEA "Predizione dell'impatto ambientale dei sistemi elettromagnetici e valutazione dell'esposizione umana", Rome (Italy)
Nov. 2001	**speaker** at the National Congress of Kinesiology "Le Scienze Motorie nella Società Complessa", Marostica (Vicenza - Italy)
Sept. 2001	3rd International Symposium on Noninvasive Functional Source Imaging within the Human heart and brain (NFSI 2001), Innsbruck (Austria)
Dec. 1998	15th National Congress of the Italian Association of Neuroradiology, Florence (Italy)
August 1993	9th International Conference on Biomagnetism, Vienna, Austria
August 1991	8th International Conference on Biomagnetism, Muenster, Germany
June 1991	International Workshop COMAC-BME "Biomagnetic investigations of nervous system", Porto Carras, Halkidiki (Greece)
July 1991	World Congress on Medical Physics and Biomedical Engineering, Kyoto (Japan)
June 1991	International Workshop COMAC-BME "Biomagnetic investigations of nervous system", Porto Carras, Halkidiki (Greece)
Dec. 1990	International Workshop COMAC-BIOMAGNETISM "Non Pharmacological treatment of cardiac arrhythmias: present and future", Centro Congressi Catholic University, Rome (Italy)
July 1989	International Conference on "Topographic EEG Analysis on Brain Mapping", Saint Vincent, Aosta (Italy)
August 1989	7th International Conference on Biomagnetism, New York City, D.C., U.S.A.

July 1984	Annual Meeting of the European Geophysical Society, Catholic University of Louvain-la-Neuve (Belgium)
October 1983	Third International School of Climatology "Climatological aspects of desertification: facts, theories and methods", Scientific Center "Ettore Majorana" (Erice, Sicilia - Italy)
Sept. 1983	Second International Meeting of Statistical Climatology (Lisboa - Portugal)
July 1982	Second International School of Climatology "Climate and Energy: Carbon dioxide", Scientific Center "Ettore Majorana" (Erice, Sicilia - Italy)
March 1980	First International School of Climatology "Climatic variations and variability: facts and theories", Scientific Center "Ettore Majorana" (Erice, Sicilia - Italy)

Visiting scientist

June 2012	one week at the Centre for Sports Studies, University of Kent at Medway (United Kingdom)
Sept 2010	two days at the Tristan Technologies, San Diego (California – USA)
Sept 2010	three days at the School of Biological Health System Engineering – Arizona State University (Arizona – USA)
March 2009	one week at the Department of Medical Physics, Wisconsin University at Madison (Wisconsin – USA)
Nov 2009	one week at the Department of Physics and Mathematics – FFLCRP, San Paolo University, Riberao Preto (San Paulo – Brazil)
October 2009	one week at the Department of Medical Physics, Wisconsin University at Madison (Wisconsin – USA)
April 2008	two weeks at the Biomedical Research and Integrative NeuroImaging (BRaIN Imaging) Center, MIND Institute, University of New Mexico, Albuquerque (New Mexico – USA)
April 2008	one week at the VenLab, Brown University, Providence (RI – USA)
July 2007	two weeks at the Biomedical Research and Integrative NeuroImaging (BRaIN Imaging) Center, MIND Institute, University of New Mexico, Albuquerque (New Mexico – USA)
June 2007	one week at the Department of Medical Physics, Wisconsin University at Madison (Wisconsin – USA)
May 2007	two weeks at the Biomedical Research and Integrative NeuroImaging (BRaIN Imaging) Center, MIND Institute, University of New Mexico, Albuquerque (New Mexico – USA)

Nov 2006	two week at the Center for Complex Systems and Brain Sciences, Florida Atlantic University - Boca Raton (Florida – USA)
May 2006	one week at the Infant Studies Laboratory, Psychology Department, Berkley University, San Francisco (California - USA)
April 2006	one week at the Department of Medical Physics, Wisconsin University at Madison (Wisconsin – USA)
April 2006	one week at the Center for Complex Systems and Brain Sciences, Florida Atlantic University - Boca Raton (Florida – USA)
Apr-July 1994	four months at the Zentralinstitut für Biomedizinische Technik (ZBMT), University of Ulm (Germany)
January 1994	one month at the Zentralinstitut für Biomedizinische Technik (ZBMT), University of Ulm (Germany)
March 1990	one month at the Physikalisch-Technische Bundesanstalt Institut (PTB), Berlin (Germany)
May 1981	one month at the Climatic Research Unit, East Anglia University, Norwich (UK)

Invited speaker

August 2013	University of São Paulo at Ribeirão Preto, 12 August 2013, with the talk "A passive robotic device, virtual reality environments and high-resolution EEG for the neuro-motor rehabilitation of post-stroke patients"
June 2012	Centre for Sport Studies, Faculty of Social Sciences – University of Kent (UK), with the talk "Effective brain connectivity: quantification methods and sample applications"
Nov 2010	First International Workshop "Fetal Magnetocardiography", MEG-Center, University of Tuebingen (Germany), with the talk " Fetal cardiac signal extraction with ICA"
Sept 2010	School of Biological Health System Engineering – Arizona State University (Arizona – USA), with the talk "Biomedical signals: acquisition and analysis"
Dec 2009	Department of Physics and Mathematics – FFLCRP, San Paolo University, Riberao Preto (San Paulo – Brazil), with the talk "Biomagnetism: functioning principles, systems and analysis methods in fetal and neonatal studies"
April 2008	VenLab, Brown University, Providence (RI – USA), with the talk "Research lines at BIND Center: overview and prospective ideas"

April 2006	Department of Kinesiology, San Francisco State University (SFSU), San Francisco (USA), with the talk "Measurement of finger dynamics in bimanual coordination experiments"
April 2006	Department of Medical Physics, Wisconsin University at Madison (Wisconsin – USA) with the talk "ICA and its application to the processing of fMCG data"
April 2006	Department of Radiology California University at San Francisco (UCSF), Center for Medical Sciences (California – USA) with the talk "Extraction of fetal cardiac signals from fMCG by means of ICA"
April 2006	Biomedical Research and Integrative NeuroImaging (BRaIN Imaging) Center, Health Sciences Center, New Mexico University, Albuquerque (New Mexico – USA) with the talk "Analysis of fMCG data: problems and solutions"
October 2002	Centro interuniversitario di ricerca in Bioingegneria e Scienze Motorie, University of Brescia, Trento e Verona, Rovereto (Italy) with the talk "The role of fMRI in motor learning"
March 1987	Max Planck Institut für Meteorologie, University of Hamburg (Germany), with the talk "Earliest instrumental data for Italian stations"
February 1987	Climatic Research Unit, East Anglia University, Norwich (UK), with the talk "Earliest instrumental data for Italian stations"
August 1982	University of Leeds (UK), with the talk "Reconstruction of the European climate in the XVIII century"

Reviewing activity for the following scientific journals:

1. **Autonomic Neuroscience: Basic and Clinical** (Elsevier) since November 2012
2. **Annals of Biomedical Engineering** (Springer) since July 2010
3. **BioMedical Engineering Online** (BioMed Central) since July 2009
4. **Biomedical signal processing and control** (Elsevier) since March 2013
5. **Biomedizinische Technik** (Walter de Gruyter) since May 2008
6. **Computers in Biology and Medicine** (Elsevier) since July 2007
7. **Computers Methods and Programs in Biomedicine** (Elsevier) since March 2011
8. **Developmental Science** (Wiley) since July 2012
9. **Early Human Development** (Elsevier) since May 2006
10. **Frontiers in Human Neuroscience** (Frontiers Publ.) since October 2013
11. **IEEE Trans. on Instrumentation & Measurement** (IEEE Publ.) since March 2007
12. **IEEE Transactions on Biomedical Engineering** (IEEE Publ.) since April 2006

13. **Journal of Medical Systems** (Springer) since August 2007
14. **Journal of Neurophysiology** (Institute of Physics Publ.) since September 2010
15. **Journal of Obstetrics and Gynaecology Research** (Blackwell) since December 2007
16. **Journal of Perinatal Medicine** (De Gruyter Publ.) since June 2011
17. **Medical & Biological Engineering & Computing** (Springer) since March 2005
18. **Medical Engineering and Physics** (Elsevier) since May 2011
19. **Neuroimage** (Elsevier) since May 2009
20. **Pediatric Research** (Lippincott Williams and Wilkins) since November 2005
21. **Physics in Medicine and Biology** (Institute of Physics Publ.) since January 2005
22. **Physica Scripta** (Institute of Physics Publ.) since May 2004
23. **Physiological Measurement** (Institute of Physics Publ.) since November 2004
24. **PLOS ONE** (PLOS Publications) since May 2013
25. **Superconductor Science and Technology** (Institute of Physics Publ.) since November 2005

Member of the Editorial Board of the following scientific journals

1. **International Journal of Biomedical Science** (IJBS Organization) since June 2007
2. **Recent Patents on Engineering** (Bentham Science Publishers) since July 2006
3. **The Open Biomedical Engineering Journal** (Bentham Science Publishers) since March 2007

Guest Associate Editor of:

1. **Frontiers in Human Neuroscience** (Frontiers, www.frontiersin.org) for the Research Topic "*Bridging the gap before and after birth: methods and technologies to explore the functional neural development in humans*", **2014**

Research projects funded by National or International Institutions

2014-2017 **European Project ANDREA** (project n° 610950) *"Active Nanocoated DRy-electrode for Eeg Applications"* – Call identifier FP7-PEOPLE-2013-IAPP. **Coordinator: Silvia Comani,** Participants: 3 Universities (Università "G. d'Annunzio", Chieti - Italy, University of Ilmenau, Germany, University of Porto, Portugal), 2 companies (Casa di Cura Villa Serena, Città S.Angelo - Italy, eemagine Medical Imaging Solutions GmbH, Berlin - Germany). The ANDREA project will develop a novel dry electrode EEG system with adjustable cap network provided with an automated sensor positioning mechanism, active preamplification and a SW toolbox for artefacts removal. The novel technologies address the requirements of high signal quality and reliability, mobility, high patient/subject comfort and long-term use, and will be validated in clinical and non clinical populations to produce a prototype optimized for broad EEG employment.
Funding: € 1.595.310,46

2009-present Research funds by the private hospital "Casa di Cura Villa Serena", Città S. Angelo (PE) – Italy.
Funding: € 97.000,00

2006-2009 **Coordinator,** international INTERLINK Project n.II04CD8G5A "New methods to reconstruct and analyze the fetal cardiac signals recorded by magnetocardiography" – in collaboration with the University of San Paolo (Brazil) and the University of Wisconsin at Madison (USA) - funds from the Italian Ministry for Research.
Funding: € 242.000,00

2001-present Research funds provided by the Chieti University on the basis of the personal scientific production.
Funding: € 120.000,00

2002-2004 **Responsible for the section Magnetocardiography,** Functional Imaging of the Human Body (FIHBO) – Marie Curie Training Site – FP5 – EU Funds

1990 European project **Biotrast COMET II**
European project **COMAC Biomagnetism Initiative**

1989 Project "Superconductive and Cryogenic Technologies", funds by the Italian National Research Council

Scientific Publications

Silvia Comani is author and co-author of more than **150 scientific papers** on peer-reviewed International Journals, International Conference Proceedings and books.

Publications in international peer-reviewed journals

2014

R. Vastano, V. Sulpizio, M. Steinisch, **S. Comani** and G. Committeri. **2014** Embodied and disembodied allocentric simulation in high schizotypal subjects. *Experimental Brain Research* 2014 May 28. [Epub ahead of print]
IF = 2.221

2013

Martin Steinisch, Maria Gabriella Tana, **Silvia Comani**. **2013** A post-stroke rehabilitation system integrating robotics, VR and high-resolution EEG imaging. *IEEE Transactions on Neural System and Rehabilitation Engineering* Published online on 18 June 2013. doi:10.1109/TNSRE.2013.2267851
2013 Sep;21(5):849-59. Epub 2013 Jun 18.
PMID:23797283
IF = 3.436

M. Bertollo, L. Bortoli, G. Gramaccioni, Y. Hanin, **S. Comani**, C Robazza. **2013** Behavioural and Psychophysiological Correlates of Athletic Performance: A Test of the Multiple-Action Plan Model. *Applied Psychophysiology and Biofeedback*, **38(2)**: 91-99. doi: 10.1007/s10484-013-9211-z
IF = 1.346

M. Steinisch, P.R. Torke, J. Haueisen, B. Hailer, D. Grönemeyer, P. Van Leeuwen, **S. Comani**. **2013** Early detection of coronary artery disease in patients studied with Magnetocardiography: An automatic classification system based on signal entropy. *Computers in Biology and Medicine* **43**:144-153
http://dx.doi.org/10.1016/j.compbiomed.2012.11.014
IF = 1.112

R. Franciotti, N.W. Falasca, L. Bonanni, F. Anzellotti, V. Maruotti, **S. Comani**, A. Thomas, A. Tartaro, J.P. Taylor, M. Onofrj. **2013** Default Network is not hypoactive in dementia with fluctuating cognition: an AD/DLB comparison. *Neurobiology of Aging* **34**: 1148-1158

doi:pii: S0197-4580(12)00471-X. 10.1016/j.neurobiolaging.2012.09.015.
IF = 6.634

2012

Steinisch M, Tana MG, Comani S. **2012** A passive robotic device for VR-augmented upper limb rehabilitation in stroke patients. *Biomed Tech* (Berl). 2012 Sep 6. doi: 10.1515/bmt-2012-4160. [Epub ahead of print] No abstract available.
IF = 1.157

E.R. Moraes, L.O. Murta Jr., O. Baffa, R.T. Wakai, **S. Comani**. **2012** Linear and non-linear measures of fetal heart rate patterns evaluated on very short fetal magnetocardiograms. *Physiological Measurement* **33**: 1563-1583
IF = 1.677

M. Bertollo, C. Robazza, W.N. Falasca, M. Stocchi, C. Babiloni, C. Del Percio, N. Marzano, M. Iacoboni, F. Infarinato, F. Vecchio, C. Limatola, **S. Comani**. **2012** Temporal pattern of pre-shooting psycho-physiological states in elite athletes: A probabilistic approach. *Psychology of Sport and Exercise* **13**: 91-98
IF = 2.152

2011

M. Steinisch, V. Sulpizio, A.A. Iorio, A. Di Naccio, J. Haueisen, G. Committeri, **S. Comani**. **2011** A virtual environment for egocentric and allocentric mental transformations: a study on a non clinical population of adults with distinct levels of schizotypy. *Biomedizinische Technik* **56(5)**: 291-299
IF = 0.590

M. Berchicci, T. Zhang, L. Romero, A. Peters, R. Annett, U. Teuscher, M. Bertollo, Y. Okada, J. Stephen, **S. Comani**. **2011** Development of mu-rhythm in infants and preschool children. *Developmental Neuroscience* **33(2)**: 130-143
IF = 3.413

L. Bortoli, M. Bertollo, **S. Comani**, C. Robazza. **2011** Competence, achievements goals, motivational climate, and pleasant psychobiosocial states in youth sport. *Journal of sports sciences* **29(2)**: 171-80.
IF = 1.619

C. Del Percio, M. Iacoboni, R. Lizio, N. Marzano, F. Infarinato, F. Vecchio, M. Bertollo, C. Robazza, **S. Comani**, C. Limatola, C. Babiloni. **2011** Functional coupling of

parietal alpha rhythms is enhanced in athletes before visuomotor performance: a coherence electroencephalographic study. *Neuroscience* **175**: 198–211.
IF = 3.122

N.A. Mensah-Brown, W.J. Lutter, **S. Comani**, J. Strasburger, R.T. Wakai. **2011** Independent Component Analysis of normal and abnormal rhythm in Twin pregnancies. *Physiological Measurement* **32**(1): 51-64.
IF = 1.430

2010

C. De Luca, M. Bertollo, **S. Comani. 2010** Non-magnetic equipment for the high-resolution quantification of finger kinematics during functional studies of bimanual coordination. *Journal of Neuroscience Methods* **192**: 173-184.
IF = 2.295

C. De Luca, K.J. Jantzen, **S. Comani**, M. Bertollo, J.A.S. Kelso. **2010** Striatal activity during intentional switching depends on pattern stability. *Journal of Neuroscience* **30**(9):3167-74.
IF = 7.221

M. Bertollo, M. Berchicci, A. Carraro, **S. Comani**, C. Robazza. **2010** Blocked and Random practice organization in the learning of rhythmic footstep dance sequences. *Perceptual and Motor Skills* **110** (1): 77-84.
IF = 0.402

2009

S. Comani, P. van Leeuwen, S. Lange, D. Geue, D. Grönemeyer. **2009** Influence of gestational age on the effectiveness of spatial and temporal methods for the reconstruction of the fetal magnetocardiogram. *Biomedizinische Technik* **54**(1): 29-37.
IF = 0.592

C. Del Percio, C. Babiloni, M. Bertollo, P.M. Rossini, N. Marzano, M. Iacoboni, F. Infarinato, M. Stocchi, C. Robazza, **S. Comani**, F. Eusebi**. 2009** Visuo-attentional and sensorimotor alpha rhythms are related to visuo-motor performance in athletes. *Human Brain Mapping* **30**(11):3527-40.
IF = 6.256

M. Steinisch, B.M. Guarnieri, J. Haueisen, A. Serio, and **S. Comani**. **2009** Virtual Reality and Robotics for Neuro-Motor Rehabilitation of Ischemic Stroke Patients. *IFMBE Proceedings*, 25(9):61-63.

2007

S. Comani and G. Alleva**. 2007** Fetal cardiac time intervals estimated on fetal magnetocardiograms: single cycle analysis vs. average beat inspection. *Physiol Meas* **28**: 49-60
IF = 1.691

K.E. Hild II, G. Alleva, S.S. Nagarajan, **S. Comani. 2007** Performance comparison of six Independent Components Analysis algorithms for fetal signal extraction from real fMCG data. *Phys Med Biol*, **52**(2): 449-462
IF = 2.784

S. Comani, V. Srinivasan, G. Alleva, G.L. Romani. **2007** Entropy based automated classification of independent components separated from fMCG. *Phys Med Biol* **52**(5): N87-N97
IF = 2.784

S. Comani, H. Preissl, D. Mantini, Q. Campbell, G. Alleva, H. Eswaran**. 2007** Comparison of algorithms for fetal signal reconstruction: Projector Operator vs. Independent Component Analysis. *International Congress Series* **1300**: 733-736.

C. De Luca, **S. Comani**, L. Di Donato, M. Caulo, M. Bertollo, GL Romani. **2007** A-magnetic optic-mechanical device to quantify finger kinematics for fMRI studies of bimanual coordination. *Brain Topography*, **19**(3):155-160**.**
IF = 1.179

K.E. Hild II, H.T. Attias, **S. Comani**, S.S. Nagarajan**. 2007** Fetal cardiac signal extraction from magnetocardiographic data using a probabilistic algorithm. *Signal Processing*, **87**(8): 1993-2004
IF = 1.256

D. Mantini, F. Petrucci, D. Pieragostino, P. Del Boccio, M. Di Nicola, C. Di Ilio, G. Federici, P. Sacchetta, **S. Comani** and A. Urbani**. 2007** LIMPIC: a computational method for the separation of protein MALDI-TOF-MS signals from noise. *BMC Bioinformatics*, **8**:101**,** 126
IF = 3.781

Denner Guilhon, Allan K Barros, **S. Comani. 2007** ECG compression by efficient coding. *Lecture Notes in Computer Science* **4666** (Independent Component Analysis and Signal Separation**,** ISBN: 978-3-540-74493-1) 4666 LNCS:593-600

2006

A. Aragri, T. Scarabino, E. Seifritz, **S. Comani**, S. Cirillo, G. Tedeschi, F. Esposito, F. Di Salle. **2006** How does spatial extent of fMRI datasets affect Independent Component Analysis decomposition? *Hum Brain Map,* **27**(9):736-746
IF = 4.888

M. Reale, M.A. De Lutiis, A. Patruno, L. Speranza, M. Felaco, A. Grilli, M.A. Macrì, **S. Comani**, P. Conti, S. Di Luzio**. 2006** Modulation of MCP-1 and iNOS by 50 Hz sinusoidal electromagnetic field. *Nitric Oxide: Biology and Chemistry*, **15**(1):50-57
IF = 2.922

D. Mantini, K.E. Hild, G. Alleva, **S. Comani. 2006** Performance comparison of independent component analysis algorithms for fetal cardiac signal reconstruction: a study on synthetic fMCG data. *Phys Med Biol,* **51**(4)**:** 1033-1046
IF = 2.784

2005

S. Comani, D. Mantini, B. Merlino, M. Reale, S. Di Luzio, GL Romani. **2005** Integrated software suite for magnetocardiographic data analysis: a proposal based on interactive programming environment. *Method Inform Med*, 44:114-123
IF = 1.057

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P. van Leeuwen for the European Task Force. European Task Force on Magnetocardiography. *15th International Conference on Biomagnetism*, 20-26 August **2006**, Vancouver (Canada)

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Book Chapters

Comani S. Principi Fisici di Risonanza Magnetica in "*Senologia 8: Risonanza Magnetica"*, A. Carriero ed., Casa Editrice IDELSON GNOCCHI Srl, Napoli (Italia), **2008**

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Teaching activity

Official courses for Bachelor, Master and Specialization students

2013 -	**Teacher,** course of **Biomechanics and basics of Bioengineering,** Bachelor degree in Human Movement Sciences (1st year), Faculty of Human Movement Sciences, Chieti University (Italy).
2011 - present	**Coordinator,** course of **Chemistry, Biochemistry and Physics Applied to Human Movement Science**, Bachelor degree in Human Movement Sciences (1st year), Faculty of Human Movement Sciences, Chieti University (Italy).
2011 - present	**Teacher,** course of **Physics Applied to Human Movement Science and Informatics,** Bachelor degree in Human Movement Sciences (1st year), Faculty of Human Movement Sciences, Chieti University (Italy).
2009 - 2013	**Coordinator of the integrated course of Basic Sciences, and Teacher** of the course of **Applied Physics**, Bachelor degree in Occupational Therapy (1st year), School of Medicine, Chieti University (Italy).
2008 - 2012	**Supervisor**, **Lab. of Physics**, Bachelor degree in Human Movement Sciences (1st year), Faculty of Human Movement Sciences, Chieti University (Italy).
2005 - 2009	**Teacher and Coordinator,** course of **Physics**, Bachelor degree in Occupational Therapy (1st year), School of Medicine, Chieti University (Italy).
2002 - 2012	**Supervisor**, **Lab. of Informatics**, Bachelor degree in Human Movement Sciences (1st year), Faculty of Human Movement Sciences, Chieti University (Italy).
2002 - 2011	**Teacher and Coordinator,** course of **Physics and Informatics Applied to Human Movement Science**, Bachelor degree in Human Movement Sciences (1st year), Faculty of Human Movement Sciences, Chieti University (Italy).
2000 – 2004	**Teacher,** course of **Physics Principles of Magnetic Resonance Imaging,** Specialization in Radiology and radio-diagnostics, School of Medicine**,** Chieti University (Italy).
1999 – 2006	**Teacher**, courses of **Basics in Electronics**, **Basics in Signal Processing** and **Physics Principles of Magnetic Resonance Imaging**, PhD Training course in Biomedical Technologies and Functional Bioimaging, School of Medicine**,** Chieti University (Italy).
1999 – 2008	**Supervisor**, **Lab. of Magnetocardiography**, Master degree in Medicine (1st year), School of Medicine, Chieti University (Italy).

1999 – 2002 **Teacher**, courses of **Physics, Biophysics, Statistics and Informatics,** Bachelor degree in Human Movement Sciences (1st year), School of Medicine, Chieti University (Italy).

1999 – 2002 **Teacher**, course of **Electric and Electronic Measurements,** Bachelor degree in Medical Radiology (1st year), School of Medicine, Chieti University (Italy).

1999 – 2000 **Teacher**, course of **Experimental Physics,** Bachelor degree in Geology (1st year), Faculty of Mathematical, Physical and Natural Sciences, Chieti University (Italy).

1998 – 2000 **Teacher**, course of **Biomedical Physics,** Master degree in Medicine (1st year), School of Medicine, Chieti University (Italy).

1996 – 1997 **Teacher**, course of **General Physics,** Master degree in Environmental Sciences (1st year), Faculty of Mathematical, Physical and Natural Sciences, Molise University, Isernia (Italy).

1994 – 1995 **Teacher**, course of **Basics in Medical Informatics,** School of Medicine, Chieti University (Italy).

1993 – 1995 **Teacher**, course of **Biomedical Physics,** Bachelor degree in Diabetes Sciences (1st year), School of Medicine, Chieti University (Italy).

1993 – 1994 **Teacher**, course of **Electromagnetic signals in the human body,** Bachelor degree in Nursery (1st year), School of Medicine, Chieti University (Italy).

1988 – 1989 **Teacher**, course of **Physics,** Master degree in Agricultural Sciences (1st year), Faculty of Agricultural Sciences, Molise University, Campobasso (Italy).

1988 – present **Teacher**, course of **Physics,** Specialization in Anaesthesiology, School of Medicine**,** Chieti University (Italy).

Mentoring and tutoring

July 2014 – present **Tutor of a post-doc researcher (Gabriella Tamburro)** for the research project " Studio della dinamica funzionale del cervello e delle interazioni mente-corpo durante compiti motori esperti e cooperativi usando un approccio multimodale che combini il monitoraggio elettroencefalografico con quello fisiologico, comportamentale e cinematico", scientific area 02 Physics, scientific sector FIS/07 Applied Physics, Dipartimento di Medicina e Scienze dell'Invecchiamento.

2013 - present **Member of the Board of Teachers**, **PhD Training Course in "Neuroscience and Imaging"**, Chieti University (Italy).

2013 **Co-supervisor of a Master student (Nastasia Ruggiero)** of the **Electronic Engineering Course, Master Degree in Bioengineering**, **University Roma3, Roma (Italy)**. Thesis: "Uso

della teoria dei grafi per la tipizzazione dell'efficienza corticale nell'endurance training ciclistico".

Oct 2011 – July 2012	**Supervisor of Miss Alexandra Oetzel from the Faculty of Computer Science and Automation, Ilmenau University of Technology (Germany)**, **LEONARDO Programme**, **for internship and thesis** "Literature review: recent advances in the use of robotic devices for stroke rehabilitation" for the degree of Bachelor of Science.
June 2011 – April 2014	**Tutor of a post-doc researcher (Maria Gabriella Tana)** for the research project "Analisi e modellizzazione della dinamica comportamentale e funzionale nella coordinazione motoria e nella transizione tra configurazioni diverse in popolazioni speciali", scientific area 02 Physics, scientific sector FIS/07 Applied Physics, Dept. of Human Movement Sciences.
July 2009 – April 2010	**Supervisor of Mr. Paul Rudi Torke** from the Faculty of Computer Science and Automation, **Ilmenau University of Technology (Germany), ERASMUS Programme**, **for internship and thesis** "Development and evaluation of an automatic system for the classification of Coronary Artery Disease based on Magnetocardiographic data" for the degree of Bachelor of Science.
Febr - July 2007	**Supervisor of Mr. Denner Guilhon from Sao Luis University (Brazil)**, who received a "**Young Researcher Grant**" for foreign students assigned by the University "G. d'Annunzio", Chieti – Italy
Febr - July 2006	**Supervisor of Mr. Vairavan Srinivasan from Multimedia University, Malaysia,** who received the first "**Young Researcher Grant**" for foreign students assigned by the University "G. d'Annunzio", Chieti - Italy
2004 - 2013	**Supervisor of PhD students** of the **PhD Training Course in Functional Neuroimaging: from cells to systems** (Giovanna Alleva, Cinzia De Luca,), of the University "G. d'Annunzio", Chieti (Italy). **Giovanna Alleva**, thesis "Misure di complessità per la caratterizzazione di sorgenti nella magnetocardiografia fetale"; **Cinzia De Luca**, thesis " The Neurophysiology of Intentional Switching Between Behavioral States: a Coordination Dynamics Approach"
2004 - 2013	**Supervisor of PhD students** of the **PhD Training Course in Human Movement Sciences** (Marika Berchicci, Martin Steinisch, Walter Nicola Falasca), of the University "G. d'Annunzio", Chieti (Italy).

	Marika Berchicci, thesis "Motor Learning and Development: From Behavioral Analysis to Neural Signature"; **Martin Steinisch**, thesis "Integrating a passive robotic device, VR technology and high-resolution EEG for the rehabilitation of post-stroke patients"; **Walter Nicola Falasca**, thesis "Sviluppo di algoritmi di dinamica causale applicati alle neuroscienze ".
2002 - 2005	**Co-supervisor of PhD student** (**Dante Mantini)** of the **PhD Training Course in e-Learning**, Department of Information Engineering, Università Politecnica delle Marche, Ancona (Italy). Thesis: "Progetto di formazione e-Learning per professionisti della salute in ambito ginecologico"
2008 -2012	**Member of the Board of Teachers**, PhD Training Course in "**Scienze Biomediche, citomorfologiche e motorie**", University "G. d'Annunzio", Chieti (Italy).
2004 - 2008	**Member of the Board of Teachers**, PhD Training Course in **"Functional Neuroimaging: from cells to systems"**, School of Medicine, University "G. d'Annunzio", Chieti (Italy).
2000 - present	**Supervisor of Bachelor degree students** during the preparation of their thesis, School of Medicine and Faculty of Human Movement Sciences, University "G. d'Annunzio", Chieti (Italy).