

Curriculum Vitae of Eugenio Coccia

GENERAL INFORMATION

Eugenio Coccia (born 15 November 1956, Italian) is an experimental physicist in the field of astroparticle physics, with a focus on the search for gravitational waves. He is internationally recognized for the development of gravitational wave detectors and is one of the authors of the discovery of gravitational waves with the LIGO-Virgo Collaboration. He is at present Professor of Physics and Rector of the “Gran Sasso Science Institute”, school of advanced studies in L’Aquila.

He graduated in Physics, cum laude, from the University of Rome “La Sapienza” in 1980 in the group of Edoardo Amaldi; he had two scholarships from CNR in 1981 and 1982, and was Post-Doc Fellow at CERN (1981-1985), research scientist (1985-1987) and associate professor (1988-1999) at the University of Rome “Tor Vergata”, before becoming full professor in the same university in 2001.

He spent long periods of research at CERN and at the INFN Frascati Laboratory, and shorter periods at the University of Leiden, in the Kamerlingh Onnes Laboratory.

He has been the Principal Investigator of the INFN experiments EXPLORER at CERN (1998-2010), and NAUTILUS at the INFN Frascati Laboratories (1992-2016), and is a member since 2006 of the laser interferometer gravitational-wave experiment VIRGO in Pisa.

He served as Director of the INFN Gran Sasso Laboratory (2003-2009), as Chair of the INFN Scientific Committee on Astroparticle Physics (2002-2003), and as President of the Italian Society for General Relativity and Gravitational Physics (2000-2004).

He was also Chair of the Gravitational Wave International Committee (GWIC, the IUPAP Working Group 11) and is Member of the Astroparticle Physics International Committee (APPIC, IUPAP Working Group 10).

He has been also member of international committees such as ECFA (European Committee on Future Accelerators) and PANAGIC (Particle and Nuclear Astrophysics and Gravitation International Committee), and was invited by CERN, the OECD Global Science Forum, the US National Academy of Science, and the European Physical Society to join international panels on the strategies of particle and astroparticle physics.

He has given lectures and seminars in Universities and research centers all over the world.

He is the author of 380 scientific papers on international journals and editor of eight books.

Citation report (Web of Science): h-index=71; Citations=35.279; Papers=389 (March 2021).

During his career he has promoted several initiatives for technology transfer. He has conducted new outreach initiatives and is an active science communicator.

AWARDS & HONORS

2017 Fellow of the European Physical Society

2017 “Medaglia Alessandro Volta” from the University of Pavia.

2016 “Special Breakthrough Prize for Fundamental Physics”,

“Gruber Cosmology Prize”,

“Einstein Medal”;

these three prizes have been awarded for the discovery of gravitational waves and are shared with the members of the LIGO-Virgo Collaboration.

2015 Member of the Academia Europaea.

2015 Member of the Accademia delle Scienze di Torino.

2015 Meritorius Member (Socio Benemerito) of the Italian Physical Society

2012 "Giuseppe Occhialini" Medal and Prize from IoP, Institute of Physics (UK), and Sif, Italian Physical Society (Italy) “*For his major contribution to the realisation of the first long term observatories with cryogenic and ultracryogenic detectors of gravitational waves, and for his international role in the gravitational wave community and in the broader community of astroparticle physics.*”

2011 *Commendatore* to the Merit of the Italian Republic, awarded by the President of the Italian Republic.

OFFICES

SCIENTIFIC MANAGEMENT

2019: Member of the Technical-Scientific Committee of ASI (Italian Space Agency)

2016: Rector of the Scuola Universitaria Superiore “Gran Sasso Science Institute”

2015 Appointed by the President of the Council of Italy in the Committee of Experts of the Research Policy (CEPR).

2015-2019: Member of the Board of Directors of INAF (Italian Institute for Astrophysics)

2013: Director of the INFN Centre of Advanced Studies and PhD School “Gran Sasso Science Institute”

2011-2015: Chairman of GWIC (Gravitational Wave International Committee)

<http://gwic.ligo.org/>. GWIC is affiliated to the IUPAP (International Union of Pure and Applied Physics) as Working Group 11.

2003 -2009: Director of the INFN Gran Sasso National Laboratories and member of the INFN Board of Directors.

2003-2009: Team Leader INFN of the European project (FP6) ILIAS, the Integrated Large Infrastructures for Astroparticle Science.

2004 -2009: Chair of COMAG (Coordination and Management Committee of the European Underground Labs), consisting of the Directors of the European underground laboratories.

2002-2003: Chairman of the INFN Scientific Committee on Astroparticle physics.

2000-2004: President of SIGRAV (Italian Society of General Relativity and Gravitational Physics, www.sigrav.org).

From **1998:** Spokesperson of the ROG Collaboration, internationally recognized for the activity of the gravitational wave detectors EXPLORER and NAUTILUS.

SCIENTIFIC COMMITTEES

2015 Member of the Scientific Council of APC -Astroparticule et Cosmologie, Paris (France)-

2015 Member of the Scientific Council of the Fermi Center, Rome (Italy)

2014 - : Member of APPIC (ASTROPARTICLE PHYSICS INTERNATIONAL COMMITTEE)

2013 - : Member of the Council of the Italian Physical Society (SIF)

2012 - : Member of the Scientific Council of the ENIGMASS Labex (federation of laboratories of Rhone-Alpes region: LAPP and LPTH Annecy-le-Vieux, LPSC Grenoble and LSM).

2010 - 2103 : Member of the Council of the European Physical Society.

2010: Member of ASEPS (Asia-Europe Physics Summit) <http://www.aseps.net/>

2006 - 2012: Member of PANAGIC (Particle and Nuclear Astrophysics and Gravitation International Committee).

2004 - 2009: Member of ECFA (European Committee on Future Accelerators).

1994: Founder of the "Edoardo Amaldi Conference on Gravitational Waves ", which is held biennially and is recognized as the reference conference in the field.

STRATEGY AND EVALUATION PANELS

2012 - : Referees for the Evaluation of research projects on behalf of the Italian Ministry of Education, University and Research and for the Evaluation of research products (VQR 2004-2010) on behalf of ANVUR

2012: Chair of the Evaluation Panel of the 3rd ASPERA Common Call

2010 - 2016: Member of the Evaluation Committee of the Fermi Center.

2010- 2011: Member of the OECD Global Science Forum Working Group on Astrop. Physics.

2009-2011: Member of the National Academy of Sciences Committee for the assessment of a deep underground science laboratory - http://www.nap.edu/catalog.php?record_id=13204

2004-2005: Member of the CERN Strategy Group, for the European Roadmap on Particle Physics

1999-2001: Member of the Evaluation Working Group of INFN.

- Evaluator of projects for American institutions (National Science Foundation, Department of Energy), German Institution (Max Planck Gesellschaft), Japanese Institutions (e.g., Institute for Cosmic Ray Research), and Italian Institution (CIVR and ANVUR).

- Referee of international journals such as Phys. Rev. Letters, Phys. Rev. D, Class. & Quantum Gravity., Int J. of Modern Phys.

SCIENTIFIC ACTIVITY

Gravitational Wave detectors

The development, design, realization, commissioning and data taking of gravitational wave detectors have taken the largest part of his scientific activity. His activity on cryogenic and ultracryogenic resonant-mass detectors, resulted in the first long-term observatories of gravitational waves. Since 2006 he is a member of the Virgo Collaboration, which has realized Virgo, the largest European interferometer, at the European Gravitational Observatory near Pisa and constitutes a network with the two LIGO detector in US. He worked on the first generation detector (Virgo), on the second generation detector (Advanced Virgo) - actually taking data - and he is involved on the project of a third generation project as well (Einstein Telescope).

Resonant-mass detectors

His main contributions in the first part of his career were done on the critical issues of the reduction of seismic noise and of thermal noise, with several original contributions. His work on seismo-acoustic noise reduction systems with cantilever beams had impact on the design of all the resonant-mass detectors and paved the way to the Virgo super-attenuators.

He was the first to develop a new generation of detectors, equipped with original ^3He - ^4He dilution refrigerators, which combined high cooling power and ultralow vibration level (in order to reduce the detector thermal noise while keeping negligible the mechanical vibration noise).

Thanks also to the implementation of a new superconducting electronics and dcSquids amplifier (to reduce the detector electronic noise), a record strain sensitivity $h = dL/L = 7 \times 10^{-22} \text{ (Hz)}^{-1/2}$ was reached with the NAUTILUS detector.

NAUTILUS was the first ultracryogenic GW detector ever built. It's the first detector to have acoustically detected cosmic rays and held for many years the record for the lowest temperature reached by a massive object of several tons (0.09 K). Some of these ideas have been used in other milliKelvin temperature detectors of GW and on particle detectors of rare events, like detectors of neutrinoless double beta decay. The main results obtained with EXPLORER and NAUTILUS range from the upper limits on the arrival of pulses of gravitational waves and on the presence of a stochastic background, to the first dynamic measurement of the gravitational field generated by an artificial source; from the first acoustic detection of cosmic rays to the study of correlations with neutrino pulses and gamma rays.

Interferometer detectors

His main technical contribution to the Virgo detector was the development of a mirror thermal compensation system. Currently, as a member of the Einstein Telescope (ET) Science Team, he is collaborating to the realization of a future European third generation gravitational wave detector, underground and equipped with cryogenic mirrors, designed for reaching the sensitivity needed to test Einstein's gravity in strong field conditions and to realize a precision gravitational wave astronomy.

Gravitational Physics

His contributions in the field of Gravitational Physics include: the study of GW signals from astrophysical sources in various gravitational theories (particularly in scalar tensor theories), the study of a possible background of gravitational waves and its detectability in scalar and tensor theories, the study of the properties and feasibility of spherical GW detectors, the study of the correlation of GW detectors data with gamma-ray and neutrino bursts detectors data.

Cosmic ray detection

This activity regarded the operation on the Explorer and Nautilus sites of cosmic ray detectors based on streamer tubes and scintillators. The main goal was to study the effect of cosmic rays and charged particle beams on resonant GW antennas acting as acoustic detectors, using coincidences with the cosmic ray detectors: these were the first studies on the thermo-acoustic effects of particles interacting with a superconducting medium. The main results were upper limits on the existence of nuclearites, quark nuggets and other exotic particles.

As Director of the Gran Sasso underground laboratory, he managed the installation of a new generation of experiments (including OPERA, ICARUS, BOREXINO), established new safety protocols in the underground laboratory, promoted new initiatives for technology transfer to local companies, and conducted new outreach initiatives.

Universities and research centers around the world which invited him to give seminars and lectures include: CERN, Fermilab, MIT, Caltech, Princeton, Yale, Oxford, RAL, Orsay, PSI, Leiden, NIKHEF, Potsdam, Dubna, Moscow, Tokyo. He also delivered plenary talks to numerous international conferences, and was the recipient of several research grants by EU, INFN, MIUR, EGO.

TEACHING ACTIVITY

Since 1985, he taught semester training courses in Physics at the University of Rome "Tor Vergata" (General Physics, Experimental Physics, Laboratory of Physics, Gravitational Physics).

Since 2012, he participates in the International Master Erasmus Mundus on Astronomy and Astrophysics, named "Astromundus", teaching "Gravitational Physics".

Since the 1st of February 2014, he has been the INFN coordinator of GraWIToN, an Initial Training Network, funded by the European Commission under FP7-Marie Curie Actions for four years. GraWIToN aims to train 13 young researchers (PhD students) in the gravitational wave (GW) search field.

He was Chair of the Board of Professors for the PhD program in Astroparticle Physics at GSSI (2013-2016), and member of the Board of Professors for the PhD programs in Physics and Astronomy at the University of Rome "Tor Vergata". He has organized several PhD schools in

Italy and abroad, notably at the University of Tokyo, at Fermilab in Chicago and in various other locations throughout Europe, as a member of the Steering Committee of SIGRAV, of the Scientific Committees of the International School of Astroparticle Physics (ISAPP), and of the International Doctorate School on Astroparticle Physics (IDAPP).

Papers

For a full list of articles in international journals and books see:

http://inspirehep.net/search?ln=en&p=f+a+coccia%2C+e&of=hb&action_search=Search&sf=earliestdate&so=d

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Books

E. Coccia, J. Silk, N. Vittorio
Gravitational Waves and Cosmology
IOS Press and Sif, 2020

R. Aloisio, E. Coccia, F. Vissani
Multiple Messengers and Challenges in Astroparticle Physics
Springer 2018

R. Aloisio, E. Coccia, N. Fornengo, L. Pandola
TAUP 2009: Proceedings of the Eleventh International Conference on Topics in Astroparticle and Underground Science
(Institute of Physics, 2010)

A. Bottino, E. Coccia, J. Morales, J. Puimedon
TAUP 2005: Proceedings of the Ninth International Conference on Topics in Astroparticle and Underground Science
(Institute of Physics, 2006)

I. Ciufolini, E. Coccia, M. Colpi, V. Gorini, R. Peron
Recent Developments in Gravitational Physics
(Institute of Physics, 2006)

I. Ciufolini, E. Coccia, V. Gorini, R. Peron, N. Vittorio
From the Hubble length to the Planck length
(Institute of Physics, 2005)

E. Coccia, G. Pizzella, G. Veneziano
Gravitational waves
Proceedings of the second Edoardo Amaldi Conference on GWs, (World Scientific, 1999)

E. Coccia, G. Pizzella, F. Ronga
Gravitational waves experiments
Proceedings of the first Edoardo Amaldi Conference on GWs, (World Scientific, 1995)