



«ETTORE MAJORANA» FOUNDATION AND CENTRE FOR SCIENTIFIC CULTURE

INTERNATIONAL SCHOOL OF COSMIC-RAY ASTROPHYSICS
«MAURICE M. SHAPIRO»

*24th Course: “Particles and the Cosmos – Bridging the infinitesimal and the infinite”
29 July – 6 August 2026*

PRESIDENT AND DIRECTOR OF THE CENTRE: PROFESSOR A. ZICHICHI

DIRECTORS OF THE COURSE: PROFESSORS J.R. HÖRANDEL, R. SPARVOLI, T. STANEV

WELCOME!



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According to legend, Erice, son of Venus and Neptune, founded a small town on top of a mountain (750 metres above sea level) more than three thousand years ago.

The great Thucydides (~500 B.C.), writing about events connected with the conquest of Troy (1183 B.C.) said: *"After the fall of Troy some Trojans on their escape from the Achaei on the sea towards the West arrived in Sicily by boat and as they settled near the border with the Sicanians all together they were named Elymi: their towns were Segesta and Erice".*



Please read front cover of your folder.

Gothic cathedral Federico II





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Antonio Zichichi

Maurice M. Shapiro



Maurice M. Shapiro

1915 - 2008

***13 November 1915, Jerusalem**

family moved to Chicago, Illinois during the early 1920s

studied physics at University of Chicago

1942 PhD with Arthur Compton - emulsions exposed Mt Evans

1941 Reviews of Modern Physics

1958 Handbuch der Physik „Nuclear Emulsions“

during WW II part of Manhattan project

1946 Association of Los Alamos Scientists [ALAS] to lobby for a civilian atomic-energy commission

**1960s U of Maryland’s High Energy group
DUMAND neutrino project**

1977 founding of ISCRA

**University of Iowa, University of Bonn
Max Planck Institute für Astrophysics, Garching
Laboratory for Cosmic-Ray Physics, Naval Research Laboratory
Department of Physics and Astronomy, University of Maryland**





Antonio Zichichi

1929 - 2026

***15 October 1929, Trapani**

PhD University of Palermo

Professor at University of Bologna

**1963 founding of Centro Ettore Majorana
International School Subnuclear Physics**

1965 1st observation of anti-deuteron at CERN

1977 - 82 president INFN

1978 - 80 president European Physical Society

1980 creation of LNGS



In the mid 1970's, discussions among Rossi, Shapiro and others recognized the need for continuing international education in the then emerging field of Cosmic Ray Astrophysics.

Prof. Zichichi who, in 1963, had founded the EMFCSC, agreed to establish the ISCRA as one of the Erice Schools, offering biennial courses with Shapiro as director.



**Antonio Zichichi and Maurice M. Shapiro
circa 2004**



1st course: Progress and Problems in Cosmic Ray Physics - 1978

M. M. Shapiro Director of the Course

PURPOSE OF THE COURSE

The goals are:

- i) To provide students with knowledge and understanding that will enhance their contributions to cosmic-ray astrophysics.
- ii) To enable lecturers and other participants to exchange ideas and explore models which may promote progress in this field.
- iii) To acquaint the students with unsolved problems in cosmic-ray physics and to advise on methods for resolving these.
- iv) To elucidate the relationship between observations (e.g. of cosmic-ray composition, spectra, and isotropy) and theories of origin, acceleration and propagation.
- v) To provide insight into the coupling between cosmic radiation and related disciplines such as radioastronomy, optical and x-ray astronomy, plasma physics, solar physics, stellar evolution, nucleosynthesis, gravitational collapse (and its consequent pulsars, neutron stars, black holes, and supernovae), geophysics, nuclear physics, cosmology, elementary particles and high energy physics.



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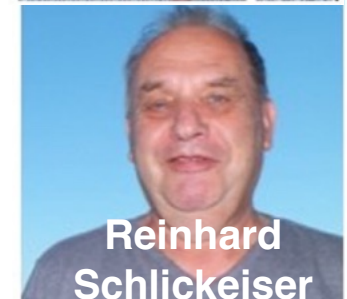
students 1978
senior attendees 2018
(40th anniversary of ISCR A)



The 1st International
School of Cosmic Ray
Astrophysics (1978)
Director of the School
M. M. Shapiro



Alan Watson



Reinhard
Schlickeiser



Todor Stanev



Subir Sarkar

1	2 Jeremy Lloyd-Evans	3 Ray Wills?	4	5	6 J. Kempler	7 Janet Luhmann	8 Kostas (Greek, Milan?)
9 Ellen Zweibel	10 G. Erdős (?)	11 Vic Stenger	12 Jorge Perez-Pereza	13 Yves David	14 John Clifford	15 Jake Waddington	16 Maurice Shapiro
17 Juan Sequiros	18 Carmen Baixeras	19	20 Maria Giller	21 G. Siegmon	22 Elana Ashley	23 Andy Strong ?	24 Rudolph Beaujean
25	26 Javiev Ottaola	27	28 Helina Bilokon	29	30 Einar Juliusson	31	32
33	34	35 Rein Silverberg	36	37 Oscar Saavedra	38 Willi Niemann	39	40
41	42 Reinhard Schlickeiser	43	44 T. Gregory Guzik	45	46	47 Peter Fowler	48 John Linsley
49 Piero Galeotti	50 Harm Moraal	51	52 Satio Hayakawa	53 John Simpson?	54 Fred Reines	55 David Schramm	56 Roger Bussard
57 Todor Stanev	58 John Cooper	59 Simon Swordy	60 Steve Jordan	61	62 Reuven Ramaty	63	64 J C Carvalho
65 Subir Sarkar	66 Arnold Wolfendale	67	68 Alan Watson	69			

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COURSES OF THE INTERNATIONAL SCHOOL OF COSMIC RAY ASTROPHYSICS

1978	Progress and Problems in Cosmic Ray Physics	Maurice M. Shapiro
1980	Acceleration of Particles in Nature	Maurice M. Shapiro
1982	Composition and Origin of Cosmic Rays	Maurice M. Shapiro
1984	Cosmic Radiation in Contemporary Astrophysics	Maurice M. Shapiro
1986	Genesis and Propagation of Cosmic Rays	Maurice M. Shapiro, John P. Wefel
1988	Cosmic Gamma Rays and Cosmic Neutrinos	Maurice M. Shapiro, John P. Wefel
1990	Cosmic Rays, Supernovae, and the Interstellar Medium	Maurice M. Shapiro, Rein Silberberg, John P. Wefel
1992	Particle Astrophysics and Cosmology	Maurice M. Shapiro, Rein Silberberg, John P. Wefel
1994	Currents in High Energy Astrophysics	Maurice M. Shapiro, Rein Silberberg, John P. Wefel



John P. Wefel

1944 - 2025

1971 PhD physics, Washington University St. Luis

US Naval Research Laboratory

University of Chicago

1982 Louisiana State University

1986 Director ISCR

Direct measurements of cosmic rays





1996	Towards the Millennium in Astrophysics - Problems and Prospects	Maurice M. Shapiro, Rein Silberberg, John P. Wefel
1998	New Vistas in Astrophysics	Maurice M. Shapiro, Rein Silberberg, Todor Stanev, John P. Wefel
2000	Astrophysical Sources of High Energy Particles and Radiation	Maurice M. Shapiro, Todor Stanev, John P. Wefel
2002	Relativistic Astrophysics and Cosmology	Maurice M. Shapiro, Todor Stanev, John P. Wefel
2004	Neutrinos and Explosive Events in the Universe	Maurice M. Shapiro, Todor Stanev, John P. Wefel
2006	Astrophysics at Ultra-high Energies	Maurice M. Shapiro, Todor Stanev, John P. Wefel
2008	Gamma Ray and Cosmic Ray Astrophysics - From Below GeV to Beyond EeV Energies - Including tribute session for Maurice M. Shapiro, who had passed the previous year. ISCR named in his honor.	Todor Stanev, John P. Wefel



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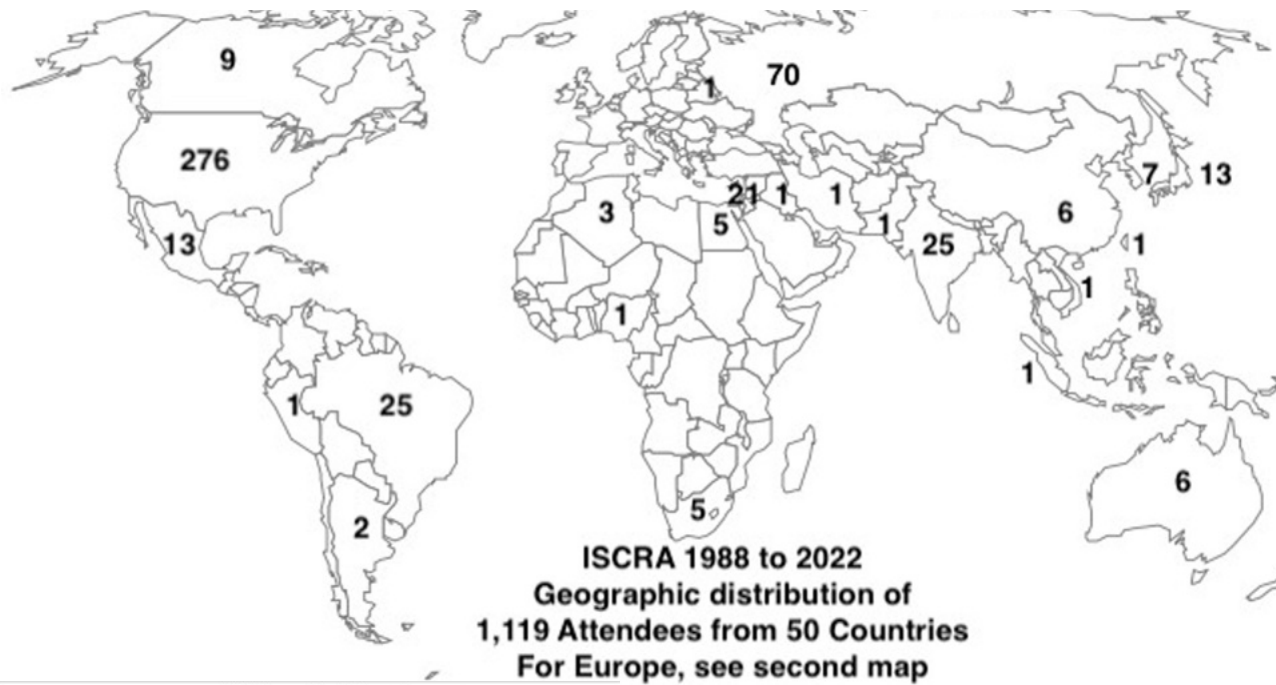
2010	Astro & Particle Physics - From Underground to Outer Space	Todor Stanev, John P. Wefel
2012	A new Era in Particle Astrophysics - New instruments, New Results and New Understanding	Jörg R. Hörandel, Todor Stanev, John P. Wefel
2014	Exploring the High Energy Universe	Jörg R. Hörandel, Todor Stanev, John P. Wefel
2016	Particle, Gamma-ray and Neutrino Astrophysics in the 21st Century	Jörg R. Hörandel, Todor Stanev, John P. Wefel
2018	Astroparticle Physics - Yesterday, Today and Tomorrow	Jörg R. Hörandel, Todor Stanev, John P. Wefel
2022	From Cosmic Particles to Gravitational Waves - Now and To Come	Jörg R. Hörandel, Todor Stanev, John P. Wefel
2024	Multi-messenger Astroparticle Physics	Jörg R. Hörandel, Roberta Sparvoli, Todor Stanev, John P. Wefel
2026	Particles and the Cosmos - Bridging the Infinitesimal and the Infinite	Jörg R. Hörandel, Roberta Sparvoli, Todor Stanev

24 courses topics evolved cosmic-ray astrophysics

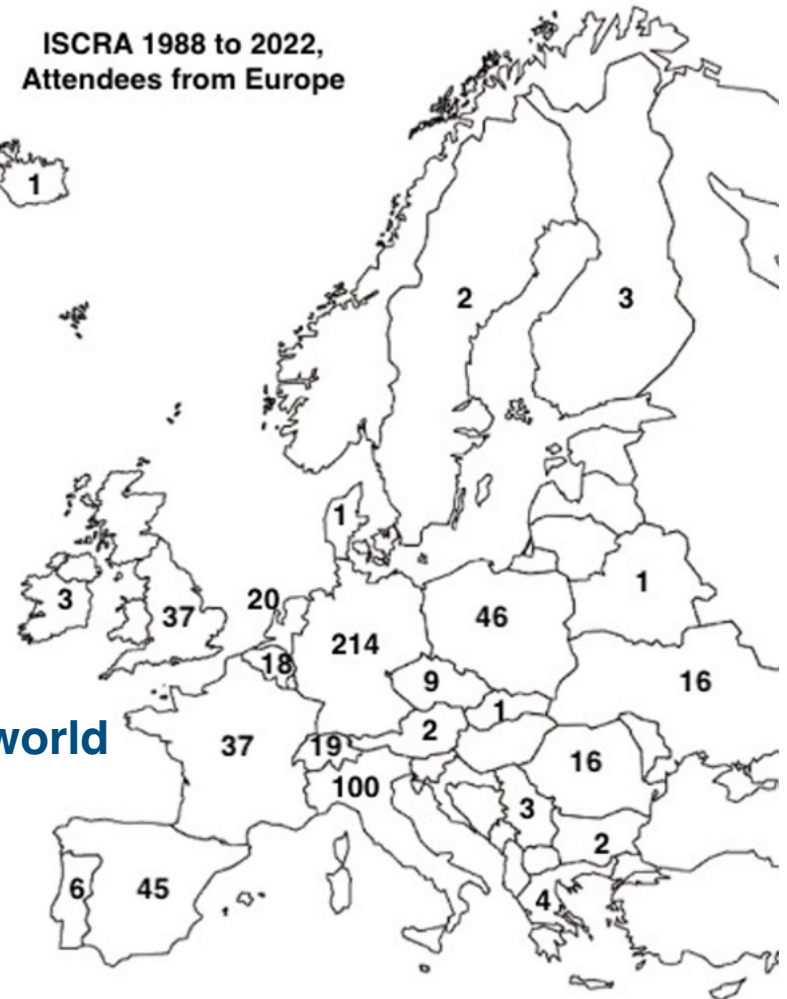


astroparticle physics

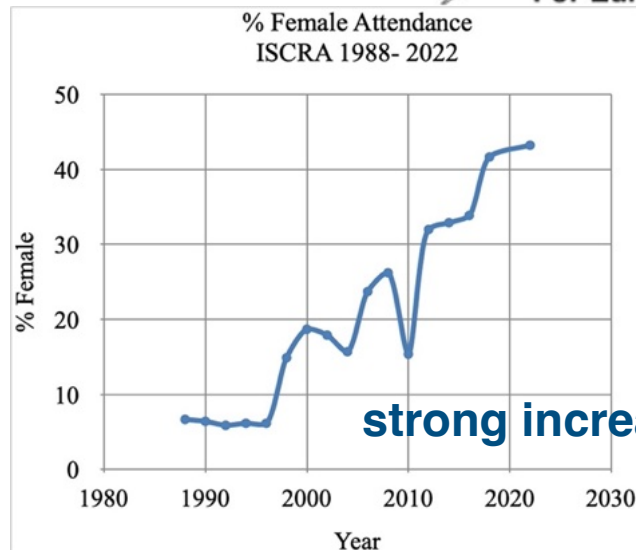
- *direct & indirect measurements of cosmic rays*
- *gamma-ray astronomy*
- *neutrino astronomy*
- *gravitational waves*



IS CRA 1988 to 2022,
Attendees from Europe



participants from around the world



strong increase of female participants

in the last 40 years ~1400 participants (lecturers, senior researchers, and students)



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SPONSORS

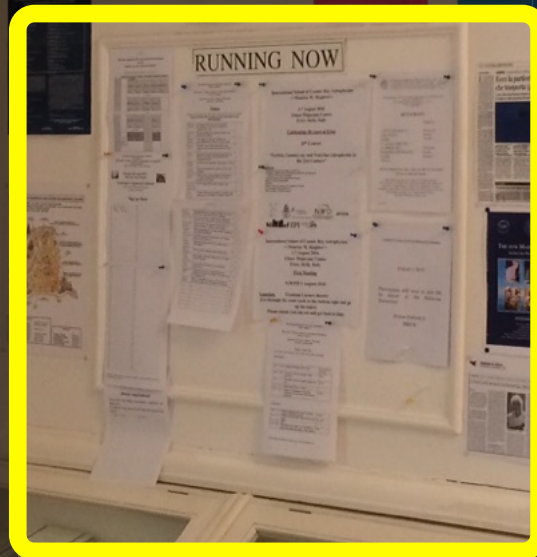


your institute/university/lab!

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announcement board for our school

another board is in San Domenico (main lecture hall)
please consult these boards regularly



- *schedule might change due to delayed arrival of people*
- *lists for excursion and departure will be displayed there*



ETTORE MAJORANA FOUNDATION AND CENTRE FOR SCIENTIFIC CULTURE

TO PAY A PERMANENT TRIBUTE TO ARCHIMEDES AND GALILEO GALILEI, FOUNDERS OF MODERN SCIENCE
AND TO ENRICO FERMI, THE "ITALIAN NAVIGATOR", FATHER OF THE WEAK FORCES



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Directors: J.R. HÖRANDEL – R. SPARVOLI – T.S. STANEV

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RESTAURANTS

INFO

ELIMO - Ristorante Panoramico

closed on Tuesday

HOTEL MODERNO

closed on Wednesday

POSTALE 17 - **By reservation only** (Monday- Wednesday Lunch only) *closed on Tuesday*

CAFFÈ PASTICCERIA MICHELE (**Lunch only**)

SFIZIAMO (*drinks included*) (**Lunch only**)

closed on Monday

VENUS

closed on Tuesday

SAN ROCCO

closed on Wednesday

EDELWEISS RESTAURANT

DOMUS BLANCA (**Dinner only**)

closed on Monday

CAMBI GUSTO (*drinks included*)

AL CONVENTO (*the restaurant can offer participants a single dish*)

closed on Monday

TA'PISO (*drinks included*)

**DRINKS (Mineral Water, Wine, Coffee, etc.) ARE NOT INCLUDED and must be
paid by participants**

Meals





- Wear your badge
- Order from School menu
- After you have finished your lunch/dinner the waiter will bring a form for you to sign.

There may be other Schools, so please make sure you sign the “Astrofisica” form & not that of another School.

- Pay for your bottled water, wine, coffee, soft drinks and any extras.



Payments

If you have not yet paid, please see Alexandro in
EMFCSC secretariat



He will also issue
receipts for
payments



Certificate of attendance

Some of you may need letters to confirm your attendance at the school for your administration at your institution.

—> contact Jörg Hörandel

(ideally contact me tomorrow or the day after)



Your Badge

Please wear your badge.

- Gives you access to the institutes
- Is necessary for meals in the restaurants
- Can get you a 10% discount in many shops
- Allows us, the staff, to know who you are
- Helps you to get to know each other

- breakfast in hotel or in San Rocco
- lunch & dinner in one of the restaurants
- in the evening: informal meeting in piano room (22:00)

one of the directors needs to be present to open room

absolute silence after 24:00



Facilities at the Ettore Majorana Centre

- Dirac Lecture Hall in San Domenico
- WiFi is available
- Washers/Dryers available
- Piano room for informal gatherings – the casks of Marsalla are for you to enjoy
- Breakfast/Snack room at bottom of stairs
coffee, tea, water, sandwiches, fruit, biscuits
- Courtyard for meetings/discussions





WI-FI connection at the
“Ettore Majorana” Foundation and Centre for Scientific Culture

SSID

EMFCSC

Password

3r1c32021!



Getting “LOST” in Erice

- Easy to do, especially after dark
- You are currently at the highest point in Erice
- Soooooo, when in doubt, walk UP-hill and you will eventually get back here
- There is a watchman on duty at the front door 24 hours a day. If locked, ring bell and show *your badge* for admittance.

Excursion on August 2nd

**please sign up for the excursion (a.s.a.p.)
and specify dietary requirements**

**bring Sun protection (Sun screen), hat
we will be outside in the Sun the complete day**

we will go to the beach (swimsuit)





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In case of questions, contact one of the directors



Roberta Sparvoli Jörg Hörandel

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Lecturers

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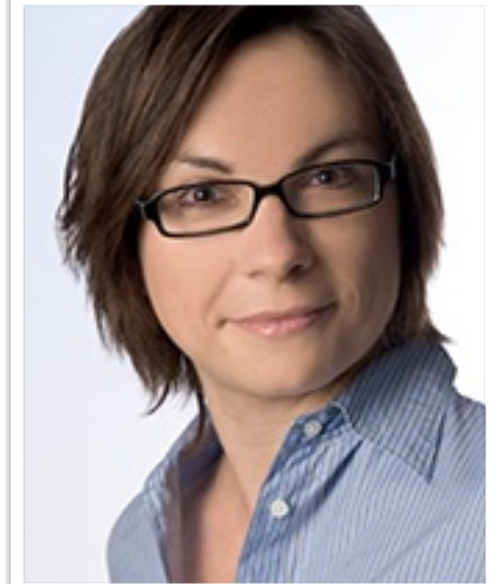
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Ground-based Gamma-ray Astronomy with Imaging Air Cherenkov Telescopes Kathrin Egberts



LHAASO gamma-ray observatory Zhen Cao



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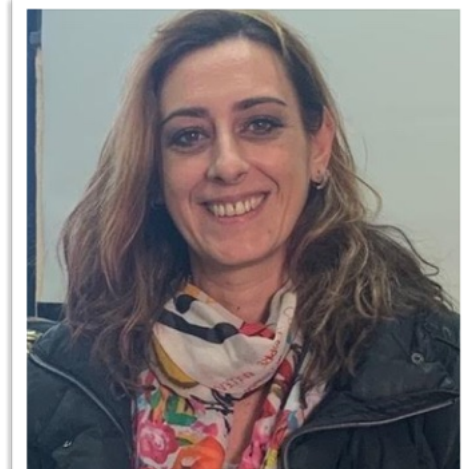
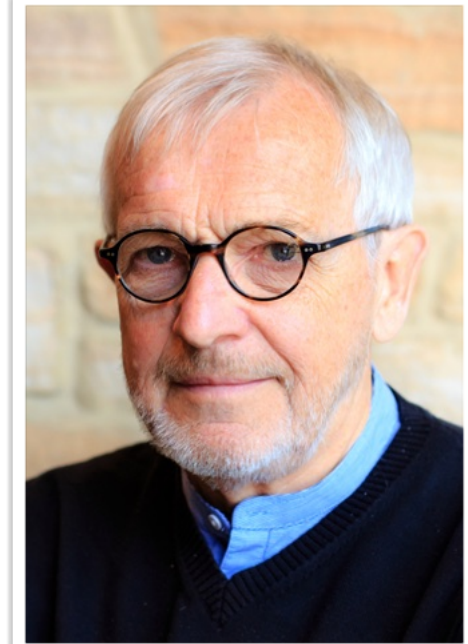
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Neutrino Astronomy

Francis Halzen

KM3NeT neutrino observatory

Carla Distefano



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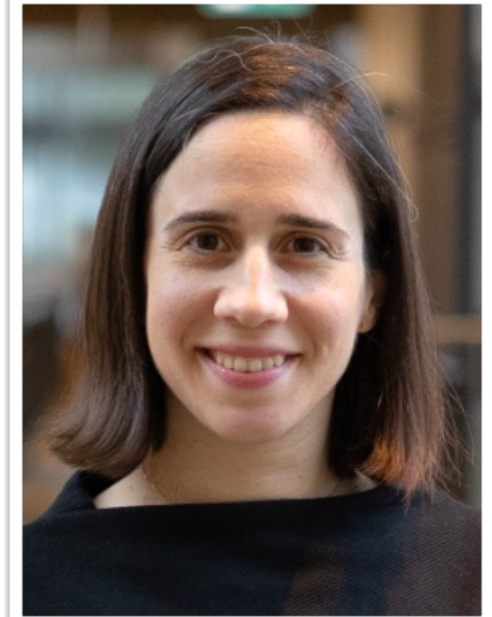
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Multi-messenger astroparticle physics Foteini Oikonomou



Gamma Ray Astronomy with satellites Aldo Morselli



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Ultra high energy cosmic rays Michael Unger



Cosmic-ray theory Philipp Mertsch



INTERNATIONAL SCHOOL OF COSMIC-RAY ASTROPHYSICS: • Progress and Problems in Cosmic Ray Physics - 1978 • Acceleration of Particles in Nature - 1980 • Composition and Origin of Cosmic Rays - 1982 • Cosmic Radiation in Contemporary Astrophysics - 1984 • Genesis and Propagation of Cosmic Rays - 1986 • Cosmic Gamma Rays and Cosmic Radiation - 1988 • Cosmic Rays, Supernovae, and the Interstellar Medium - 1990 • Particle Astrophysics and Cosmology - 1992 • Currents in High Energy Astrophysics - 1994 • Toward the Millennium in Astrophysics: Problems and Prospects - 1996 • New Vistas in Astrophysics - 1998 • Astrophysical Sources of High Energy Particles and Radiation - 2000 • Relativistic Astrophysics and Cosmology - 2002 • Neutrinos and Explosive Events in the Universe - 2004 • Astrophysics at Ultra-high Energies - 2006 • Gamma Ray and Cosmic Ray Astrophysics: From below GeV to beyond 10^{20} eV Energies - 2008 • Astro & Particle Physics: From Underground to Outer Space - 2010 • A New Era in Particle Astrophysics - 2012 • Exploring the High Energy Universe - 2014 • Particle, Gamma-ray and Neutrino Astrophysics in the 21st Century - 2016 • Astroparticle Physics: yesterday, today, and tomorrow - The 40th anniversary of the ISCRA - 2018 • From Cosmic Particles to Gravitational Waves - now and to come - 2022 • Multi-Messenger Astroparticle Physics - 2024



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INTERNATIONAL SCHOOL OF COSMIC-RAY ASTROPHYSICS

«MAURICE M. SHAPIRO»

24th Course: “Particles and the Cosmos – Bridging the infinitesimal and the infinite”

29 July – 6 August 2026

Dark Matter Milena Crnogorcevic



Gravitational waves Simone Mastrogiovanni



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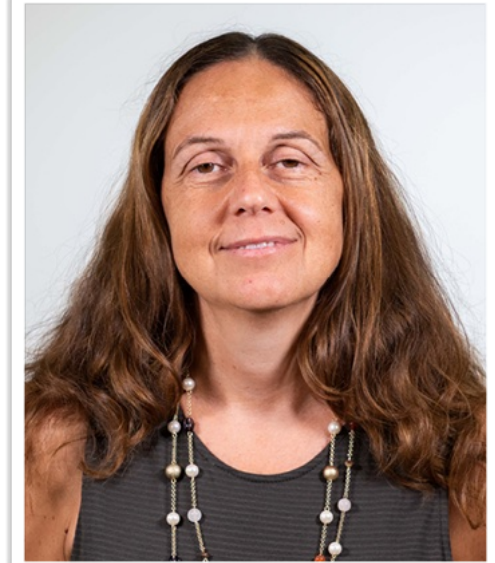
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Direct measurements of cosmic rays Roberta Sparvoli



Radio detection of cosmic rays Jörg Hörandel



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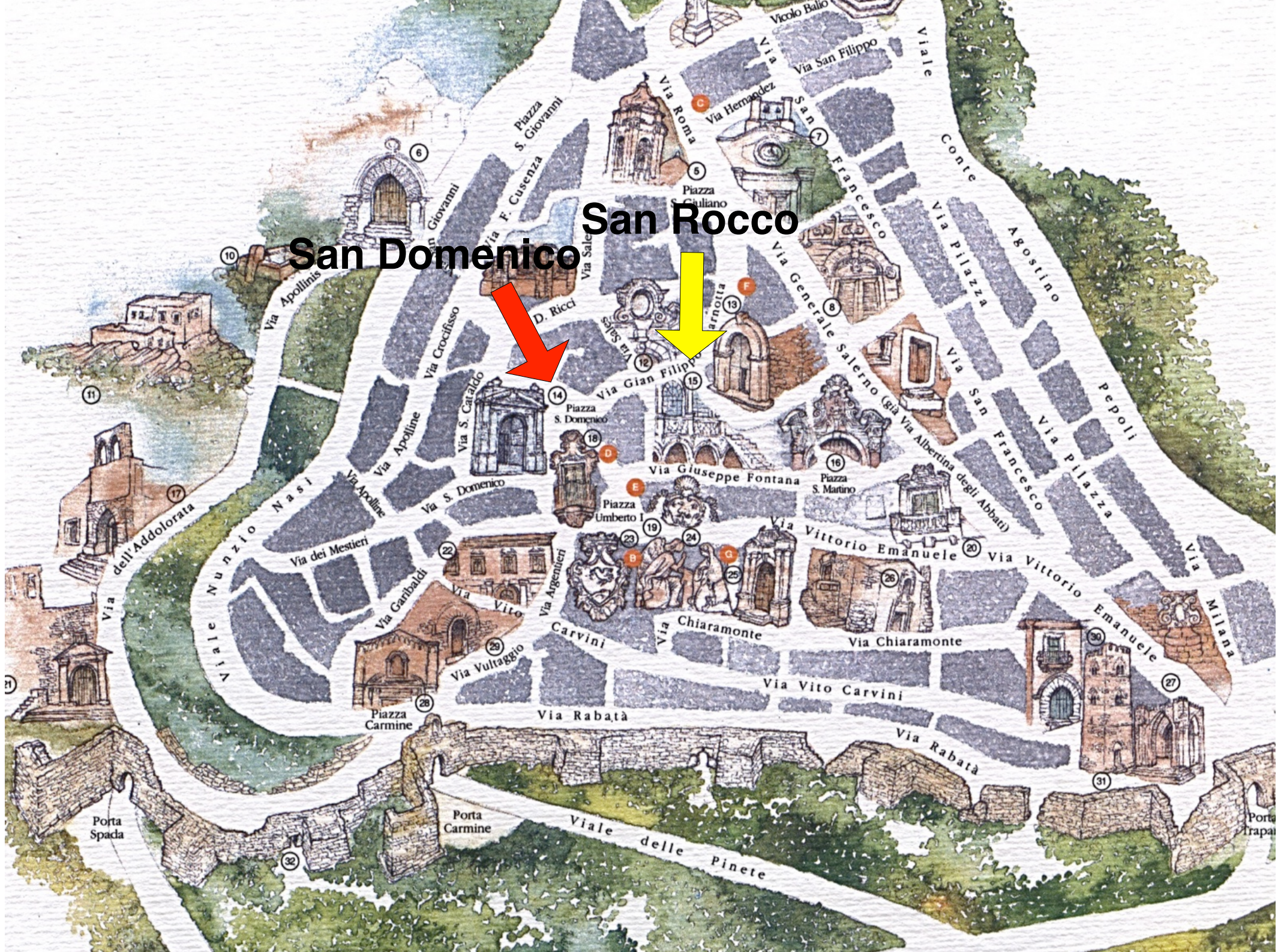
Introductions

- Let's go around the room and everyone give your name and where you are from
- And say just a word about your work / interests



San Domenico

San Rocco





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Drucken PDF Vollbildansicht Detailansicht Filter					
09:00	opening				Jörg Hörandel
	Erice, Sicily, Italy				09:00 - 09:05
	Neutrino astronomy				Francis Halzen
	Erice, Sicily, Italy				09:05 - 10:05
10:00	Cosmic Ray Theory				Phillip Mertsch
	Erice, Sicily, Italy				10:10 - 11:10
11:00	coffee				
	Erice, Sicily, Italy				11:15 - 11:45
	Ultra high-energy cosmic rays				Michael Unger
12:00	Erice, Sicily, Italy				11:50 - 12:50
13:00	lunch				



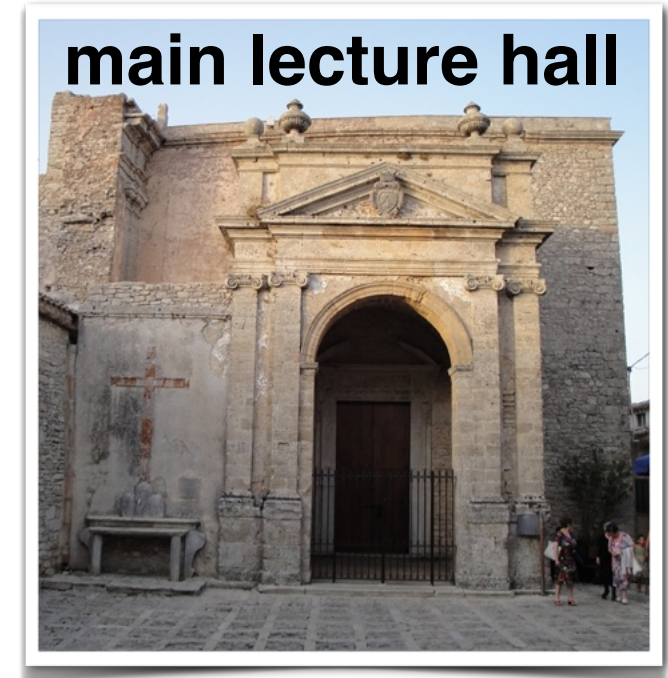


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15:00	Multi-messenger astroparticle physics <i>Erice, Sicily, Italy</i>	<i>Foteini Oikonomou</i> 15:00 - 16:00
16:00	Cosmic ray theory <i>Erice, Sicily, Italy</i>	<i>Phillip Mertsch</i> 16:05 - 17:05
17:00	coffee <i>Erice, Sicily, Italy</i>	17:10 - 17:40
	CoREAS and ZHAireS Radio Air-Shower Simulations for POEMMA Balloon with Radio (PBR) <i>Erice, Sicily, Italy</i>	<i>Paula Gálvez Molina</i> 17:45 - 17:57
18:00	Exploring the All-Particle Cosmic-Ray Spectrum with HAWC <i>Erice, Sicily, Italy</i>	<i>Ana Laura Colmenero César</i> 18:00 - 18:12
	Tau neutrinos in IceCube <i>Erice, Sicily, Italy</i>	<i>Christopher Eldridge</i> 18:15 - 18:27
	Effects of extragalactic magnetic field on the spectra of ultra-high-energy cosmic rays from jetted sources <i>Erice, Sicily, Italy</i>	<i>Sarah Sippert</i> 18:30 - 18:42



Poster presentations

posters will be on display in the San Rocco courtyard

Friday 17:45-19:00

presenters:
be around your poster
to give explanations as
needed

all:
walk around and read
the posters



ISCRA Modus Operandi



- This is a School, not a conference, so expect background material as well as results. You are expected, even encouraged, to ask questions after the presentations. *[Remember there are no stupid questions, but there can be stupid answers.]*
- Equally important is the availability to meet with and question the senior people during meals, coffee breaks, evenings. Ask about science, yes, but also about jobs, funding, visas, conferences or other things – *this is your opportunity !*



Presentations and Discussion

- **Giovani takes care of the A/V equipment in the lecture hall. See him in advance if you have a question or need to try out a presentation.**
- **Please use the computer at the podium. Load your talk in advance and put it on the desktop.**
- **Use the microphones to ask questions, but turn them *OFF* when not in active use.**
- **We will make all slides available on indico.**



Sharing the Facilities

- **There are other Courses/Workshops running simultaneously here.**
- **Everyone will want access to the Piano room (evenings)**
- **Good opportunity to meet new people and learn about a different field**
- **Staff are ‘stretched’ so be patient**

Reception

- Downstairs in Piano Room
- Two kegs of Marsala wine (sweet and dry) are available for your enjoyment
- Please mix and get acquainted
- BUT, please keep the noise level down since some are trying to sleep.
- Tomorrow we start promptly at 9:00





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PRESIDENT AND DIRECTOR OF THE CENTRE: PROFESSOR A. ZICHICHI

DIRECTORS OF THE COURSE: PROFESSORS J.R. HÖRANDEL, R. SPARVOLI, T. STANEV

WELCOME!