

# ISAPP Summer Institute - Using particle physics to understand and image the Earth

Ferrara (Italy) - 2-12 July 2018

<https://indico.cern.ch/event/660892/>

Monday - 2 July 2018					
9.00	9.30	Registration			
9.30	9.45	Welcome of Director of IUSS (Massimo Coltorti)			
9.45	10.00	Welcome of Director of INFN Ferrara (Raffaele Tripiccone)			
10.00	10.30	Introduction to ISAPP Summer Institute - Using particle physics to understand and image the Earth (Fabio Mantovani)			
Pre-school for geoscientists			Pre-school for physicists		
10.30	11.30	A time travel of 14 billion years	Giovanni Fiorentini	Origin and evolution of the Earth	Bill McDonough
11.30	12.30	A time travel of 14 billion years	Giovanni Fiorentini	Origin and evolution of the Earth	Bill McDonough
12.30	13.30	Cosmic rays	Lorenzo Perrone	Basics of seismology and Earth structure	Fabio Cammarano
13.30	14.30	Lunch			
14.30	15.30	The building blocks of universe, their interactions and conservation laws	Giovanni Fiorentini	Composition of the Earth	Bill McDonough
15.30	16.30	Experimental Methods for Particle Astrophysics	Thierry Laserre	Geodynamics picture of the Earth	Ondrej Sramek
16.30	17.00	Coffee Break			
17.00	18.00	Experimental Methods for Particle Astrophysics	Thierry Laserre	Introduction to the Earth's heat flow	Ondrej Sramek
18.00	18.30	Discussion		Discussion	

Tuesday - 3 July 2018					
Pre-school for geoscientists			Pre-school for physicists		
9.00	10.00	An introduction to Neutrinos in Physics and Astrophysics	Giovanni Fiorentini	Methods to study the Earth: geology, mineralogy, petrology, geochemistry, geodynamics	Bill McDonough
10.00	11.00	Some misteries in our Universe	Giovanni Fiorentini	Methods to study the Earth: geology, mineralogy, petrology, geochemistry, geodynamics	Bill McDonough
11.00	11.15	Coffee Break			
11.15	12.15	Experimental Methods for Particle Astrophysics	Thierry Laserre	Basics of seismology and Earth structure	Fabio Cammarano
12.15	13.15	Experimental Methods for Particle Astrophysics	Thierry Laserre	Basics of seismology and Earth structure	Fabio Cammarano
13.15	14.30	Lunch			
14.30	15.30	Cosmic rays	Lorenzo Perrone	Geodynamics through time: secular cooling	Claude Jaupart
15.30	16.30	Fundamentals of radioactivity - Nuclei, nuclear stability and radiations	Fabio Mantovani	Gravity and geodesy	Mirko Reguzzoni
16.30	17.00	Coffee Break			
17.00	18.00	Fundamentals of radioactivity - Nuclei, nuclear stability and radiations	Fabio Mantovani	Gravity and geodesy	Mirko Reguzzoni
18.00	18.30	Discussion		Discussion	

Wednesday - 4 July 2018			
9.00	10.00	Statistical tools in particle physics	Eligio Lisi
10.00	11.00	Statistical tools in particle physics	Eligio Lisi
11.00	11.15	Coffee Break	
11.15	12.15	Uncertainties in geophysics and geology	Juan Alcalde
12.15	13.15	Uncertainties in geophysics and geology	Juan Alcalde
13.15	14.30	Lunch	
14.30	15.30	Mantle temperature and Earth's heat budget	Jaupart Claude
15.30	16.30	Mantle temperature and Earth's heat budget	Jaupart Claude
16.30	16.45	Coffee Break	
16.45	18.15	Time-resolved two million year old supernova activity discovered in the Earth's microfossil record	Bishop Shawn
18.15	18.30	Discussion	

Thursday - 5 July 2018			
9.00	10.00	Everything you wanted to know about uncertainties but were too afraid to ask	Students
10.00	11.00	Everything you wanted to know about uncertainties but were too afraid to ask	Students
11.00	11.15	Coffee Break	
11.15	12.15	Chemical cosmology, solar nebula and meteorites	Bill McDonough
12.15	13.15	Chemical cosmology, solar nebula and meteorites	Bill McDonough
13.15	14.30	Lunch	
14.30	15.30	Chemical cosmology, solar nebula and meteorites	Bill McDonough
15.30	16.30	Chemical cosmology, solar nebula and meteorites	Bill McDonough
16.30	20.30	Poster session + aperitif	

Friday - 6 July 2018			
9.00	10.00	Cosmic-ray-produced nuclides: production systematics in terrestrial and extraterrestrial materials.	Marc Caffee
10.00	11.00	Cosmic-ray-produced nuclides: production systematics in terrestrial and extraterrestrial materials.	Marc Caffee
11.00	11.15	Coffee Break	
11.15	12.15	Multi-messenger astronomy: merging of two neutron stars and implications for r process isotope production	Giuseppe Pagliara
12.15	13.15	Multi-messenger astronomy: merging of two neutron stars and implications for r process isotope production	Giuseppe Pagliara
13.15	14.30	Lunch	
14.30	15.30	Muon Tomography	Cristina Carloganu
15.30	16.30	Muon Tomography	Cristina Carloganu
16.30	16.45	Coffee Break	
16.45	18.15	Reactor neutrino detection today & (maybe) tomorrow	Anatael Cabrera
18.15	18.30	Discussion	

Saturday - 7 July 2018			
Geological field trip			
9.00	10.00	Introduction to the field trip	Costanza Bonadiman – Valentina Brombin - Virginia Strati
10.00	19.30	Geological field trip on Euganean Hills, with historical overview of the region and the main towns	
20.00	22.30	Dinner on Euganean Hills	

Monday - 9 July 2018			
9.00	10.00	Neutrino physics and detection methods	Mark Chen
10.00	11.00	Neutrino physics and detection methods	Mark Chen
11.00	11.15	Coffee Break	
11.15	12.15	Detecting geoneutrinos and reactors antineutrinos	Livia Ludhova
12.15	13.15	Detecting geoneutrinos and reactors antineutrinos	Livia Ludhova
13.15	14.30	Lunch	
14.30	15.00	Introduction to calculations	Sandra Zavatarelli - Livia Ludhova - Marica Baldoncini - Virginia Strati - Barbara Ricci
15.00	17.30	Extraction of geoneutrino flux from experimental event distribution	Students divided in 4 groups work together solving problems and make calculations
17.30	18.30	Report from each group (4 presentations of 10' + 5' of questions)	Students' report

Tuesday - 10 July 2018			
9.00	10.00	Underground production of noble gas nuclides	Ondrej Sramek
10.00	11.00	U, Th and K distribution in the Earth	Ondrej Sramek
11.00	11.15	Coffee Break	
11.15	12.15	Potassium neutrino detection	Mark Chen
12.15	13.15	Potassium neutrino detection	Mark Chen
13.15	14.30	Lunch	
14.30	15.00	Introduction to calculations	Sandra Zavatarelli - Livia Ludhova - Marica Baldoncini - Virginia Strati - Barbara Ricci
15.00	17.30	Calculating the antineutrino flux from reactors	Students divided in 4 groups work together solving problems and make calculations
17.30	18.30	Report from each group (4 presentations of 10' + 5' of questions)	Students' report

Wednesday - 11 July 2018			
9.00	10.00	Cosmic-ray-produced nuclides as chronometers and tracers of terrestrial landscape evolution	Marc Caffee
10.00	11.00	Cosmic-ray-produced nuclides as chronometers and tracers of terrestrial landscape evolution	Marc Caffee
11.00	11.15	Coffee Break	
11.15	12.15	Neutrino radiography of the Earth: Neutrino Absorption and IceCube	Carsten Rott
12.15	13.15	Neutrino radiography of the Earth: Neutrino Absorption and IceCube	Carsten Rott
13.15	14.30	Lunch	
14.30	16.00	Seismic isolation of Virgo interferometer	Giancarlo Cella
16.00	16.15	Coffee Break	
16.15	16.30	Introduction to calculations	Ondrej Sramek - Bill McDonough - Marica Baldoncini - Virginia Strati
16.30	18.00	Calculating the Earth heat and neutrino luminosity	Students divided in 4 groups work together solving problems and make calculations
18.00	18.30	Report from each group (4 presentations of 5')	Students' report
19.30	22.30	Social dinner	

Thursday - 12 July 2018			
9.00	10.00	Antineutrinos directional measurement	Hiroko Watanabe
10.00	11.00	Antineutrinos directional measurement	Hiroko Watanabe
11.00	11.15	Coffee Break	
11.15	12.15	Presentation of the winner posters (presentation of 20' + 10' question time)	Students
12.15	13.15	Presentation of the winner posters (presentation of 20' + 10' question time)	Students
13.15	14.15	Lunch	
14.15	15.45	Discussion	
15.45	16.00	Coffee Break	
16.00	17.30	Neutrino radiography of the Earth: Neutrino Oscillation Tomography	Carsten Rott
17.30	18.30	Neutrino radiography of the Earth: Neutrino Oscillation Tomography	Carsten Rott