



ETTORE MAJORANA FOUNDATION AND CENTRE FOR SCIENTIFIC CULTURE

1963–2023

60th ANNIVERSARY OF ACTIVITIES



INTERNATIONAL SCHOOL OF NONEQUILIBRIUM PHENOMENA

5th Course: CHAOS AND INFORMATION DYNAMICS IN QUANTUM MANY BODY SYSTEMS

ERICE-SICILY: 26 NOVEMBER – 2 DECEMBER 2023

Sponsored by the: • Italian Ministry of Education, University and Scientific Research • Sicilian Regional Government

PROGRAMME AND LECTURERS

Many-body entropies and entanglement from polynomially-many local measurements

• L. PIROLI, Università di Bologna, IT

Control phases and phase transitions in few-particle quantum systems: An analytical approach

• M. BUKOV, MPIKS, Dresden, DE

Resilient infinite randomness criticality for a disordered chain of interacting Majorana fermions

• N. CHEPIGA, TU Delft, NL

Emergence of unitary symmetry in quantum chaotic systems

• A. DIMARSKY, University of Kentucky, Lexington, KY, US

Solvable models of driven-dissipative systems

• V. GRITSEV, University of Amsterdam, NL

Theory of robust quantum many-body scars in long-range interacting systems

• A. LEROSE, University of Oxford, UK

From designs to ETH via free probability

• S. PAPPALARDI, University of Köln, DE

Quantum computing with globally driven rydberg atom arrays

• H. PICHLER, University of Innsbruck, AT

Error-resilience phase transitions in encoding-decoding quantum circuits

• X. TURKESHI, University of Köln, DE

The statistical properties of eigenstates in chaotic many-body quantum systems

• D. LUITZ, University of Bonn, DE

PURPOSE OF THE COURSE

To understanding of the generic dynamics of quantum many-body systems is a crucial task for many applications of quantum physics, including quantum communication and computation. A quantum computer is indeed ultimately a many body system subject to external driving addressing a specific task. In particular, it is well known that quantum information stored in a many-body system is subject to degradation either resulting from external dephasing or from internal interaction leading to its scrambling among many-degrees of freedom.

It was recently understood that this process is intimately related to quantum chaotic dynamics driven by many-body interactions, leading to an intense research activity devoted to the characterisation and exploitation of chaos in many-body systems.

In this School we plan to focus on a comprehensive account of this recent research activity in this subfield of non-equilibrium physics, focusing on a broad class of topics including for example scrambling, out-of-time order correlations, thermalisation dynamics.

APPLICATIONS

Persons wishing to attend the Course should send an application, by electronic mail, to:

Professor Bernardo Spagnolo email: bernardo.spagnolo@unipa.it

Specifying:

- i) Date and place of birth together with present nationality;
- ii) Present position and place of work;
- iii) An abstract, if they wish to give a contribution (oral or poster).

PLEASE NOTE

Participants must arrive in Erice no later than 12 a.m. on 26th November 2023.

POETIC TOUCH

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 founder of modern history — i.e. the recording of events in a methodic and chronological sequence as they really happened without reference to mythical causes — 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 arrived in Sicily by boat and as they settled near the border with the Sicilians all together they were named Elymi: their towns were Segesta and Erice.*»

This inspired Virgil to describe the arrival of the Trojan royal family in Erice and the burial of Anchises, by his son Aeneas, on the coast below Erice. Homer (~1000 B.C.), Theocritus (~300 B.C.), Polybius (~200 B.C.), Virgil (~50 B.C.), Horace (~20 B.C.), and others have celebrated this magnificent spot in Sicily in their poems. During seven centuries (XIII-XIX) the town of Erice was under the leadership of a local oligarchy, whose wisdom assured a long period of cultural development and economic prosperity which in turn gave rise to the many churches, monasteries and private palaces which you see today.

In Erice you can admire the Castle of Venus, the Cyclopean Walls (~800 B.C.) and the Gothic Cathedral (~1300 A.D.). Erice is at present a mixture of ancient and medieval architecture. Other masterpieces of ancient civilization are to be found in the neighbourhood: at Motya (Phoenician), Segesta (Elymian), and Selinunte (Greek). On the Aegadian Islands — theatre of the decisive naval battle of the first Punic War (264-241 B.C.) — suggestive neolithic and paleolithic vestiges are still visible: the grottoes of Favignana, the carvings and murals of Levanzo.

Splendid beaches are to be found at San Vito Lo Capo, Scopello, and Cornino, and a wild and rocky coast around Monte Cofano: all at less than one hour's drive from Erice.

More information about the activities of the Ettore Majorana Foundation can be found on the WWW at the following address:
<https://ettoremajoranafoundation.it>