

## MAJORANA IMPACT ON CONTEMPORARY PHYSICS

Ettore Majorana (1906 – 1938) passed through theoretical physics like a meteor. In fact, his “official” fundamental papers are just nine. They all were written in the short period from 1928 to 1933. They are audacious and strongly beautiful works which impose themselves over and over again on any generation of theoretical physicists as the paradigm of a style able to fuse - by a singular critical thinking – both the attention for the experimental data and the freedom of theoretical reasoning in a mathematical formulation reaching the essential core of the problem.

At the beginning, their fame was directly linked to the topics of the period and consequently they were perceived in a slightly different way by theoretical physicists and mathematicians. On a purely physical level, just consider, for instance, the Majorana-Brossel effect, the adiabatic spin-flip and the Heisenberg-Majorana exchange forces, while - on the more specifically physical mathematical one - the Lorentz group at infinite dimension and the Dirac matrices’ representation in real form. It was only in the ‘50s – ‘60s that the importance of works such as *Teoria Relativistica di Particelle con Momento Intrinseco Arbitrario* and *Teoria Simmetrica dell’Elettrone e del Positrone* started to be fully comprehended. They both are still a source of inspiration for many Quantum Field Theory approaches, such as the representation of spinorial fields whose implications span the physics of neutrinos and much more “exotic” objects like anyons and Majorana zero modes, or the roles of Clifford algebras and non-commutative geometries.

During the last years, a new kind of interest for Majorana legacy has grown. The widening of theoretical physics’ spheres has favoured an increasing awareness of the deep connection between symmetries and interactions, and a renewed conception of theoretical physics and mathematics relation. How Roger Penrose effectively wrote, the deeper our understanding of physical laws becomes, the more we penetrate into the abstract world of mathematical concepts. Which thing allowed the new generation of theorists to get out new topics from Majorana work and to approach theoretical physics according to what we can define as the Majorana style. In this way, the Majorana ideas have found elegant and fecund applications in new fields. That is the case of the Riemann-Majorana-Bloch Sphere, which from being a hidden structure in *Atomi Orientati in Campo Magnetico Variabile* showed to be precious in Quantum Computing and in studying the non-local correlations or the Majorana Oscillator, implicitly included in his Neutrino Theory.

This anthology has been thought not only as an owed celebrative act, but especially as a meeting of researchers on some presently debated aspects in physics in Majorana spirit.

As the editor, coordinating the work of friends and colleagues has been an exciting and compelling experience. I am really grateful to all of them for taking part so cordially and creatively in Majorana Centenary Special Issue. Special thanks for Erasmo Recami: Ettore Majorana and his work have been a constant of our long friendship. This issue could not be published without Ammar Sakaji – Editor in Chief of the Electronic Journal of Theoretical Physics – who promptly and enthusiastically agreed to the project and followed its growing up with his usual care and Sante Di Renzo Publisher in Rome for the hard copy version.

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