History of Science

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The research of the subgroup of *History of Science* mainly focused on the historical and foundational side of physics in the last century and it was also developed in collaboration with national and international research institutions (Dipartimento di Fisica, Roma La Sapienza, Dipartimento di Scienze della Persona, Bergamo, Max Planck Institut fuer Wissenschaftsgeschichte, Berlin, Seminario di Storia della Scienza Univ. di Bari, Centro Interuniv.di Fondamenti e Filosofia della Fisica di Cesena). In particular, the research starting from previous years concerned the following subjects.

During the last century deep innovations in the representation of the physical world presented themselves, not only pertaining to material instruments as counters, bubble chambers, reactors, accelerators, and to conceptual ones as mathematical algorithms (as, for example, tensors, matrices, operators, wavefunctions) suitable to achieve such representation, but first of all to the conception of the fundamental properties attributed to physical objects. Of course, as A. Einstein and L. Infeld clarify in *The Evolution of Physics* (New York, Simon & Schuster, 1938) [1], such innovations in the representation of the physical world did not spring out of nothing, but presupposed some evidences in the history of physics previous to the XX century. Neverthless, such evidences could not be translated by themselves into new representations of things, in default of elements, essentially new ideas and new general principles, through which new solutions to the arising problems could succeed. So, even though electricity and light had already been conceived in the second half of the XIX century in terms of discrete corpuscules in some phenomena, these phenomena were not explained before a principle of quantization of energy in general was introduced, together with an irreducible casuality of energy exchanges, to explain several microphysical phenomena, even contrary to A. Einstein's opinion. Analogously, also Relativity theory presupposed many previous evidences which,to be explained, required its full enunciation in terms of principles of special and general relativity, even pertaining to the structure of space–time at large. But XX century physics was not only a physics of the enormously big and of the enormously small, and it was also applied to ordinary dimensions systems so contributing to the study of systems different from strictly physical ones, such as biological, chemical and endowed, as aggregate systems, with more or less high levels of complexity. Also here, of course, evidences in favour of a new physics, even in the framework of deterministic classical physics, were not missing, as in the study of thermodynamic systems, especially far from equilibrium, as in whirling and turbulence phenomena. In fact, some complexity degree had been singled out even in elementary (or considered such), strictly deterministic mechanical systems, as the famous three interacting bodies of Newtonian mechanics, by the great mathematician J. H. Poincaré. He in fact evidentiated complexity and relative unforeseeability of the evolution of such system in terms of non linearity and sensitive dependence on little variations of the initial conditions.Simulation through computers and mathematical modelling can then now contribute to study the evolution of complex systems in general, dealing with enormous quantities of data and calculations which cannot be considered exhaustive in front of systems of whatever complexity and nature, not only physical and in particular meteorological, but also chemical, biological and even economical, social and mental ones. Physical research, even still at technological and applicative levels, goes on exploiting ideas and principles, as the complexity, quantization and relativity principles, arisen at the turning points from XIX to XX century physics. Einstein's contribution to this evolution of physics has been undoubtedly incalculable, but also Italian physicists, particularly Fermi and his group, gave a considerable contribution to the rise of contemporary physics both at the tecnological - applicative and at the theoretical and foundational levels [2], without even disregarding the contributions of our local scientific tradition and University [12] and even including our preservation and enhancement of a valuable scientific instruments heritage [13].

REFERENCES

1. A. Rossi, "L'evoluzione della fisica", *Il Veltro. Rivista della Civiltà Italiana* **LIII**, 5–6 (2009).
2. A. Rossi and C. Buttaro, "The Foundational Side of Italian Physics in the First Half of the XXth Century", in: G. Franco G., *Sentieri Aperti della Ragione - Verità Metodo Scienza. Scritti in onore di Dario Antiseri nel suo* 70° *compleanno* (Lecce, Pensa Editore, 2010).
3. A. Rossi and C. Buttaro, "Il Versante Fondazionalista della Fisica Italiana nella Prima Metà del XX Secolo", *Atti del XXIX Congresso Nazionale di Storia della Fisica e dell'Astronomia, Firenze 2009*, in press.
4. A. Rossi and C. Buttaro, "Enrico Persico e il Versante Fondazionalista della Fisica Romana del '900", *Atti del XXVIII Congresso Nazionale di Storia della Fisica e dell'Astronomia, Bergamo 2008*, in press.
5. A. Rossi, "Einstein e l'Evoluzione della Fisica tra Ottocento e Novecento", *Atti del XXX Congresso Nazionale di Storia della Fisica e dell'Astronomia, Urbino 2010*, in press.
6. A. Rossi, "Il Processo a Galileo: Una Questione Ancora Aperta?", appendice di: *Giovanni Paolo II, Scienza e Verità*, a cura di M. Castellana (Lecce, Pensa Multimedia, 2010).
7. A. Rossi, "Portata e Limiti della Filosofia della Natura di Fronte alla Fisica: Passato e Presente", *Giornale di Fisica della Società Italiana di Fisica*, **L** (2009), supplement.
8. A. Rossi, "Science and Common Sense: The Relativistic Turn", in C. Alunni, M. Castellana, D, Ria and A. Rossi (eds.), *Albert Einstein et Hermann Weyl 1955-2005. Questions Épistèmologiques ouvertes* (Manduria, Barbieri Selvaggi Editori, Paris, Editions Rue d'Ulm, 2010).
9. A. Rossi, "René Thom: Forms, Catastrophes and Complexity", *Proceedings of the International Conference of the Italian Society for Logic and Philosophy of Science*, Bergamo 2010, in press.
10. A. Rossi, "Dai Modelli Riduzionistici della Realtà Fisica nella Scienza Classica alla Complessità nella Scienza Contemporanea", *Atti della Scuola Estiva di Filosofia della Fisica "Riduzionismo e complessità"*, Cesena 2010, in press.
11. A. Rossi, "R. J. Boscovich's Philosophy of Space", *Proceedings of the International Conference on "R. J. Boscovich: 1711-2011"*, University of Pavia, 8–10 September 2011, in press.
12. A. Rossi, "La Tradizione Fisico-Matematica Salentina tra '800 e '900", in A. Rossi, A. L. Denitto, G. Belmonte, A. Castellano, L. Ruggiero and G. Sava (eds.), *Per una Storia della Scienza e Tecnologia nel Salento dall'Unità a Oggi* (Galatina, Congedo, in print).
13. A. Rossi, "La Partecipazione Leccese al Versante Scientifico–Tecnologico del Progetto Finalizzato Beni Culturali (1995-2001)", in VV.AA. *Scienza e Ambiente nel Salento Contemporaneo* (Lecce, Il Grifo, in print).