

1. Record Nr.	UNINA9910795874303321
Titolo	Ultra-Cold Atoms, Ions, Molecules and Quantum Technologies // Helene Perrin, Robin Kaiser, and Michele Leduc, editors
Pubbl/distr/stampa	[Place of publication not identified] : , : Science Press, EDP Sciences, , [2022] ©2022
ISBN	2-7598-2746-1
Edizione	[First edition.]
Descrizione fisica	1 online resource (192 pages)
Collana	Current Natural Sciences Series
Disciplina	530.12
Soggetti	Quantum theory
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Frontmatter -- Preamble -- Coordinators, Contributors, Sponsors and Acknowledgments -- Preface: Fifteen miraculous years: bypassing impossibility theorems -- Contents -- Chapter 1 Cooling and Trapping Atoms -- Chapter 2 Cold Atom Instruments and Metrology -- Chapter 3 Single Atoms and Single Photons: Quantum Information Exchange -- Chapter 4 Quantum Simulation with Cold Atoms -- Chapter 5 Waves and Disorder -- Chapter 6 Trapping and Cooling Ions -- Chapter 7 Cold and Ultracold Molecules -- Chapter 8 Conclusion and Everything Else This Book Could also Have Been About... -- Index
Sommario/riassunto	Physicists know how to produce gases at a few billionths of a degree above absolute zero. The cooling methods apply not only to atoms but also to ions and molecules. This field of research has three times been awarded the Nobel Prize. The field experienced remarkable growth when experimentalists learned how to vary at will the interactions between particles, trapping them with optical tweezers or in optical gratings with adjustable geometry. Artificial crystals made of atoms or molecules can be built to simulate the structure of matter and elucidate some of its magnetic properties, hopefully contributing to the understanding of high-temperature superconductivity. The phenomenon of quantum entanglement is the basis for new devices for the storage and transmission of quantum information. Spectacular progress is constantly being made in metrology. For example, ultra-

cold atom or ion clocks measure time to better than one second over the lifetime of the Universe. New types of industrial gravimeters and gyroscopes are improving the sensitivity of seismology and navigation in space. In addition, the extreme precision of the measurements allows tests of the fundamental laws of physics, such as quantum electrodynamics, Lorentz invariance or possible variations of the fundamental constants. The field of ultra-cold particles has now reached the stage where it provides insights in the fields of condensed matter, chemistry and even cosmology.

---