1.	Record Nr.	UNINA9910438118403321
	Autore	Sagawa Takahiro
	Titolo	Thermodynamics of Information Processing in Small Systems [[electronic resource] /] / by Takahiro Sagawa
	Pubbl/distr/stampa	Tokyo : , : Springer Japan : , : Imprint : Springer, , 2013
	ISBN	1-283-63303-5
		9786613945488
		4-431-54168-3
	Edizione	[1st ed. 2013.]
	Descrizione fisica	1 online resource (125 p.)
	Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
	Disciplina	621.402
		621.4021
	Soggetti	Thermodynamics
		Quantum computers
		Spintronics
		Statistical physics
		Dynamical systems
		Physics
		Nanoscale science
		Nanoscience
		Nanostructures
		Quantum Information Technology, Spintronics
		Complex Systems
		Mathematical Methods in Physics
		Nanoscale Science and Technology
		Statistical Physics and Dynamical Systems
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Note generali	Description based upon print version of record.
	Nota di bibliografia	Includes bibliographical references.
	Nota di contenuto	Review of Maxwell's Demon -- Classical Dynamics, Measurement, and Information -- Quantum Dynamics, Measurement, and Information -- Unitary Proof of the Second Law of Thermodynamics -- Second Law with Feedback Control -- Thermodynamics of Memories -- Stochastic Thermodynamics -- Nonequilibrium Equalities with Feedback Control.-

Conclusions.

Sommario/riassunto

This thesis presents a general theory of nonequilibrium thermodynamics for information processing. Ever since Maxwell's demon was proposed in the nineteenth century, the relationship between thermodynamics and information has attracted much attention because it concerns the foundation of the second law of thermodynamics. From the modern point of view, Maxwell's demon is formulated as an information processing device that performs measurement and feedback at the level of thermal fluctuations. By unifying information theory, measurement theory, and the recently developed theory of nonequilibrium statistical mechanics, the author has constructed a theory of "information thermodynamics," in which information contents and thermodynamic variables are treated on an equal footing. In particular, the maximum work that can be extracted by the demon and the minimum work that is needed for measurement and information erasure by the demon has been determined. Additionally, generalizations of nonequilibrium relations such as a Jarzynski equality for classical stochastic systems in the presence of feedback control have been derived. One of the generalized equalities has recently been verified experimentally by using sub-micron colloidal particles. The results obtained serve as fundamental principles for information processing in small thermodynamic systems, and are applicable to nanomachines and nanodevices.