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Autore	Kapon Itzik
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Nota di contenuto	Introduction -- Stiffnessometer, a Magnetic-Field-Free Superconducting Stiffness Meter and Its Application -- The Nature of the Phase Transition in the Cuprates as Revealed by the Stffnessometer -- Opening a Nodal Gap by Fluctuating Spin-Density-Wave in Lightly Doped La2-xSrxCuO4 -- Conclusions.
Sommario/riassunto	A new experimental method – the "Stiffnessometer", is developed to measure elementary properties of a superconductor, including the superconducting stiffness and the critical current. This technique has many advantages over existing methods, such as: the ability to measure these properties while minimally disturbing the system; the

ability to measure large penetration depths (comparable to sample size), as necessary when approaching the critical temperature; and the ability to measure critical currents without attaching contacts and heating the sample. The power of this method is demonstrated in a study of the penetration depth of LSCO, where striking evidence is found for two separate critical temperatures for the in-plane and out-of-plane directions. The results in the thesis are novel, important and currently have no theoretical explanation. The stiffnessometer in a tool with great potential to explore new grounds in condensed matter physics. .