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Storing Information in Single Atom Magnets[1] FABIAN NATTERER, Ecole Polytechnique Fdrale de Lausanne, Switzerland, KAI YANG, WILLIAM PAUL, PHILIP WILKE, TAEYOUNG CHOI, IBM Almaden Research Center, San Jose, CA, USA, THOMAS GREBER, Universitt Zrich, Switzerland, ANDREAS J. HEINRICH, CHRIS P. LUTZ, IBM Almaden Research Center, San Jose, CA, USA — In a Gedankenexperiment about shrinking the size of a magnetic bit, the single atom magnet is the natural limit. Previous experimental efforts reached a size of few atoms per individually addressable magnetic bit, but a recent report of magnetic remanence for ensembles of holmium (Ho) atoms on magnesium oxide (MgO) promised a path toward stable magnetic bits at the atomic limit. It remained unclear, however, how to access the individual magnetic centers. Here we demonstrate the reading and writing of individual Ho atoms on MgO, and show that they independently retain their magnetic information over several hours. We read the Ho states by tunnel magnetoresistance and write with current pulses using a scanning tunneling microscope. We prove magnetic origin of the long-lived states by single-atom electron spin resonance (ESR) and measure a large magnetic moment of (10.1+/-0.1) Bohr magnetons. The high magnetic stability combined with electrical reading and writing shows that single atom magnetic memory has become a physical reality.

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