IBM announced it has managed to successfully store data on a single atom for the first time. The research, carried out at the Almaden lab in Silicon Valley, was [published in the scientific journal Nature](http://www.nature.com/news/magnetic-hard-drives-go-atomic-1.21599) March 8.

Computers process bits, pieces of information that have two states—on or off, interpreted as 1s and 0s by the machine. Every computer program, tweet, email, Facebook, is made up of some long series of 1s and 0s. When information is stored on a computer, it’s generally saved on a hard drive that encodes that same series of 1s and 0s on a magnetic disk or [electrical cells](http://www.makeuseof.com/tag/solidstate-drives-work-makeuseof-explains/). As IBM states in its release, the average hard drive uses about 100,000 atoms to store a single bit of information using traditional methods.

IBM’s researchers found a way to magnetize individual atoms of the rare earth element holmium and use the two poles of magnetism—north and south for encoding of 1s and 0s respectively. The holmium atoms are attached to a surface of another material, magnesium oxide, which holds them in place, at a chilly 5 kelvin. Using essentially what is a very accurate, sharp, and small, needle, the researchers can pass an electrical current through the holmium atoms, which causes their north and south poles to flip, replicating the process of writing information to a traditional magnetic hard drive. The atoms stay in whatever state they’ve been flipped into, and by measuring the magnetism of the atoms at a later point, the scientists can see what state the atom is, mirroring the way a computer reads information it’s stored on a hard drive.

IBM says that at this recording density, all 35 million iTunes songs fit on a disk the size of a credit card. Now all that remains is to see if that’s feasible.