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The gravitational analog of Faraday's induction law DANIEL ZILE[1], JAMES OVERDUIN[2], Towson University — Michael Faraday, the discoverer of electromagnetic induction, was convinced that there must also be a gravitational analog of this law, and he carried out drop-tower experiments in 1849 to look for the electric current induced in a coil by changes in gravitational flux through the coil. This work, now little remembered, was in some ways the first investigation of what we would now call a unified-field theory. We revisit Faraday's experiments in the light of current knowledge and ask what might be learned if they were to be performed today. We then review the gravitational analog for Faraday's law that arises within the vector (or gravito-electromagnetic) approximation to Einstein's theory of general relativity in the weak-field, low-velocity limit. This law relates spinning masses and induced "mass currents" rather than spinning charges and electric currents, but is otherwise remarkably similar to its electromagnetic counterpart. The predicted effects are completely unobservable in everyday settings like those envisioned by Faraday, but are thought to be relevant in astrophysical contexts like the accretion disks around collapsed stars, thus bearing out Faraday's remarkable intuition.

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