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## Description of Additional Supplementary Files

**File Name:** Supplementary Movie 1

**Description:** ER dynamics in a dendritic branch of a CA1 pyramidal cell. Maximum intensity projections from two-photon z-stacks (980 nm excitation) taken every 10 min over a period of 5 h. *Upper image:* ER-EGFP signal showing the ER lumen. *Lower image:* ER EGFP signal (green) merged with the cytosolic filler tdimer2 (red). Vertical structure with dim ER signal is an axon.

**File Name:** Supplementary Movie 2

**Description:** Uncaging of MNI-glutamate in zero  $Mg^{2+}$  induces ER entry into spines. Two-channel time lapse image (*left:* ER-EGFP, green; *right:* cytoplasmic tdimer2, red) of two-photon glutamate uncaging on dendritic spines. Note strong volume increase in stimulated spine and ER entry.

**File Name:** Supplementary Movie 3

**Description:** MyoV DN impairs ER entry into spines. Two-photon time lapse showing ER dynamics in a dendritic branch of two CA1 pyramidal cells. *Upper image:* Control neuron, expressing ER-EGFP, tdimer2 and mCerulean. *Lower image:* Neuron with compromised myosin V function (expressing ER-EGFP, tdimer2 and MyoV DN). Note absence of ER visits to spines.