SUPPLEMENTARY NOTE

**Time-lapse imaging.** For time-lapse observation cells were cultured in dishes that each had an etched coverslip (Bellco Biotechnology) glued to the bottom and an unetched coverslip glued to the top (separated by a spacer so that the top coverslip was in contact with the medium). Time-lapse imaging was done on a Zeiss inverted confocal (LSM-510) equipped with phase-contrast (Olympus UPlanApo 20x 0.7 N.A. ph2 air objective) and an environmental chamber. Images were acquired every 10 minutes. In pilot experiments, we found excitation of blebbistatin to be phototoxic, consistent with recent observations on nonneuronal cells (Kolega, J. Biochem. Biophys. Res. Comm. 320, 1020-1025 (2004)). Blebbistatin exhibits bright fluorescence and has a broad absorption spectrum. Using a long wavelength (633nm) and very low light level (0.5% laser power) we found it possible to acquire phase images every 10 minutes with no adverse effects. Our longest experiment was 22 hrs. The rate of outgrowth in the time lapse series was the same as for neurons imaged only twice separated by a long time interval.

**Quantitative analysis of turning.** For analysis of time-lapse recordings the behavior of individual neurites were followed in the recordings as they interacted with the borders. They were scored in four categories; turning, branching, sidestepping and crossing. The data is shown in Table 1a.