Supplementary Table 1. Primary antibodies used in this study and validation evidence.

All primary antibodies used in this study were validated for the species and application in which they were used. Validation evidence includes manufacturer datasheets, peer-reviewed citations (CiteAb antibody database, *https://www.citeab.com/*), and where applicable, in-house genetic validation by loss-of-function in this study. Antibodies against the Arp2/3 complex subunits (Arp2, ARPC1A, ARPC2, ARPC3, ARPC4, ARPC5) were validated in-house by reduction of signal in *Actr3* conditional knockout cortical lysates (Fig. 4b, c).

Target	Catalog #	Supplier	Host / Clonality	Species reactivity	Application in this study	Validation evidence	Reference figures
Arp3	07-272	Millipore (Upstate)	Rabbit polyclonal	Human, mouse, rat	WB, ICC	Manufacturer datasheet: WB validated, single band at ~47 kDa. Knockout-validated in this study by loss of signal in Actr3 conditional KO cortical lysates and neurons. Cited in 9 peer-reviewed publications (CiteAb).	Fig. 3a; Fig. 4b, c; Ext. Data Fig. 9a
Arp3	A5979	Sigma-Aldrich	Mouse monoclonal (FMS338)	Human, mouse, rat	WB	Manufacturer datasheet: validated by WB and ICC. Used in this study as orthogonal Arp3 antibody for ICC; complemented Millipore 07-272 used for WB.	Ext. Data Fig. 9h
Arp2	5614S	Cell Signaling Technology	Rabbit monoclonal (D85D5, XP)	Human, mouse, rat	WB	Manufacturer datasheet: rigorously validated in-house by WB; recognizes endogenous Arp2; does not cross-react with Arp3. Specificity confirmed in this study by reduction of signal in Actr3 conditional KO lysates (consistent with co-destabilization of Arp2/3 complex subunits upon Arp3 loss).	Fig. 4b, c
ARPC1A	HPA004334	Sigma-Aldrich (Atlas / Prestige)	Rabbit polyclonal	Human (validated); cross-reactivity inferred for mouse	WB	Human Protein Atlas Prestige antibody, validated by WB, ICC and IHC against the human proteome. Specificity in this study supported by reduction of signal in Actr3 conditional KO lysates (Arp2/3 subunit co-destabilization).	Fig. 4c
ARPC2	07-227	Millipore (Upstate)	Rabbit polyclonal	Human, mouse, rat	WB	Manufacturer datasheet: validated by WB, ICC, IHC. Cited in 90+ peer-reviewed publications (CiteAb). Specificity in this study supported by reduction of signal in Actr3 conditional KO lysates (Arp2/3 subunit co-destabilization).	Fig. 4b, c
ARPC4	sc-68394	Santa Cruz Biotechnology	Mouse monoclonal	Mouse, rat, human	WB	Manufacturer datasheet: validated by WB. Specificity in this study supported by reduction of signal in Actr3 conditional KO lysates (Arp2/3 subunit co-destabilization).	Fig. 4c
ARPC5	sc-166760	Santa Cruz Biotechnology	Mouse monoclonal (C-3)	Mouse, rat, human	WB	Manufacturer datasheet: validated by WB; cited in published studies (CiteAb). Specificity in this study supported by reduction of signal in Actr3 conditional KO lysates.	Fig. 4b, c

Target	Catalog #	Supplier	Host / Clonality	Species reactivity	Application in this study	Validation evidence	Reference figures
Tau-1	MAB3420	Millipore (Chemicon)	Mouse monoclonal (PC1C6, IgG2a)	Bovine, human, rat (validated); mouse (used in this study)	ICC, IHC (axon marker)	Manufacturer datasheet: validated by WB and IHC; recognizes dephosphorylated Tau (Ser195/198/199/202). Cited in 65+ publications (CiteAb). Established axon marker in neuronal polarization research, consistent with seminal use by Dotti & Banker.	Fig. 3f; Fig. 4e, i; Fig. 5a, i; Ext. Data Fig. 4g; Ext. Data Fig. 8a, l, o; Ext. Data Fig. 12e, k
β-tubulin III (TUJ1)	T2200	Sigma-Aldrich	Rabbit polyclonal	Human, mouse, rat	ICC (neurite/microtubule marker)	Manufacturer datasheet: validated by WB, ICC, IHC, IP. Cited in 580+ publications (CiteAb). Single band at ~50 kDa; specificity confirmed against neuronal lysates.	Fig. 3f; Fig. 4i; Fig. 5a, i; Ext. Data Fig. 4g; Ext. Data Fig. 8l, o; Ext. Data Fig. 11a; Ext. Data Fig. 12e, k
Non-muscle myosin IIb (MYH10)	8824	Cell Signaling Technology	Rabbit monoclonal (D8H8, XP)	Human, mouse, rat	ICC	Manufacturer datasheet: validated in-house by WB and IF; recognizes endogenous total myosin IIb; does not cross-react with myosin IIa or IIc isoforms. Confirmed isoform specificity per Cell Signaling validation pipeline.	Fig. 4l, m; Ext. Data Fig. 6f, g
Phospho-MRLC (Ser19)	ab2480	Abcam	Rabbit polyclonal	Human, mouse, rat, C. elegans, Xenopus	WB	Manufacturer datasheet: validated by WB, IP, IHC-P, ICC/IF; <1% cross-reactivity with non-phosphorylated MRLC by ELISA. Cited in 140+ publications (CiteAb). Specificity in this study supported by Western blot at expected MW with WT/KO comparison.	Ext. Data Fig. 9h, i
Phospho-MRLC (Ser19)	3675	Cell Signaling Technology	Mouse monoclonal	Human, mouse, rat	WB	Manufacturer datasheets: rigorously validated in-house by WB and IF; specific for Ser19-phosphorylated MRLC. Used as orthogonal antibodies to ab2480 to confirm phospho-MRLC localization.	Ext. Data Fig. 9h, i
MRLC (total)	PA5-17624	Thermo Fisher (Invitrogen)	Rabbit polyclonal	Human, mouse, rat	WB	Manufacturer datasheet: validated by WB. Used to assess total MRLC levels alongside phospho-MRLC for normalization.	Ext. Data Fig. 9h, i
MRLC (total)	3672	Cell Signaling Technology	Rabbit polyclonal	Human, mouse, rat	WB	Manufacturer datasheet: rigorously validated in-house by WB and IF; recognizes endogenous total MRLC. Used as orthogonal antibody to PA5-17624.	Ext. Data Fig. 9h, i
GFP	ab13970	Abcam	Chicken polyclonal (IgY)	Recognizes GFP (Aequorea victoria) and derivatives	ICC (signal amplification of GFP-tagged constructs)	Manufacturer datasheet: validated by ICC/IF and WB; specifically detects GFP (UniProt P42212, ~27 kDa). Cited in 5,400+ publications since 2004 (CiteAb). Specificity confirmed by absence of staining in non-GFP-transfected cells.	Ext. Data Fig. 8o

Target	Catalog #	Supplier	Host / Clonality	Species reactivity	Application in this study	Validation evidence	Reference figures
GAPDH	Acris	ACR001P	Mouse monoclonal	Human, mouse, rat	WB (loading control)	Manufacturer datasheet: validated by ICC/IF and WB. Cited in 38 publications (CiteAb).	Ext. Data Fig. 9h, i

Secondary antibodies. All secondary antibodies (Alexa Fluor-conjugated and HRP-conjugated; Thermo Fisher and Jackson ImmunoResearch) were affinity-purified and cross-adsorbed against IgG of other species to minimize cross-reactivity. Each was validated by the manufacturer for the host species and application combination used.

Abbreviations: *WB, western blot; ICC, immunocytochemistry; IF, immunofluorescence; IHC, immunohistochemistry; IP, immunoprecipitation; KO, knockout.*