Supplementary Figure 1. Regeneration of the QC-specific marker *WOX5* after root-tip excision at various distances from the tip.

Time-lapse of confocal median longitudinal section of single regenerating roots in *pWOX5::GFP* after root-tip excision at 70 μm (a), 130 μm (b), 200 μm (c), 270 μm (d) from the tip, at consecutive time points (dpc, days post cut; hpc, hours post cut); bars, 50 μm. Note that the *WOX5* marker appears earlier in roots cut at 70 μm than in roots cut more distally, as evident from the distal expression already at 5h in the presumptive endodermal file when cut at 70 μm (a compared to b or c).
Supplementary Figure 2. Cell type-specific markers during regeneration.

a,b, Time-lapse of confocal median longitudinal sections of single regenerating roots in plants expressing the pericycle-specific reporter E3754, source of lateral root initiation in intact roots (a; inset, mature region of the root with initiating lateral root), or the ground tissue-specific reporter J0571 (b). None of these fate-specific markers are expressed in the distal region during early reorganization at 1 dpc; bars, 50 μm.
Supplementary Figure 3. Cell cycle inhibition blocks regeneration.

a, b, Frequency of gravitropic response in CYCB1;1::GFP after excision at 130 μm from the tip compared to uncut, with treatments of different concentrations of the cell cycle inhibitors hydroxyurea (a, HU), n = 49 (uncut, 0 mM), 39 (uncut, 2 mM), 32 (uncut, 5 mM), 10 (cut, 0 mM), 23 (cut, 2 mM), 39 (cut, 5 mM), or L-Buthionine-sulfoximine (b, BSO), n = 44 (uncut, 0 mM), 65 (uncut, 0.5 mM), 82 (uncut, 1.0 mM), 57 (cut, 0 mM), 34 (cut, 0.5 mM), 51 (cut, 1.0 mM). At 2.0 mM of HU, or at 0.5 mM of BSO, a modest level of toxicity, as indicated by gravitropism of uncut roots, corresponded to a significant reduction of regeneration in cut roots; accordingly, morphological regeneration of the root tips was inhibited at 2.0 mM HU and 0.5 mM BSO. These treatments indicate that inhibition of cell cycle progression results in a significant reduction of root-tip regeneration competence, suggesting that normal cell cycle progression is a requirement for regeneration; error bars, s.e.m.
Supplementary Figure 4. *WOX5* and lugol staining during regeneration.
Confocal median longitudinal section (a,c,e) and lugol staining (b,d,f) of the same roots (a and b, c and d, e and f) at 1 dpc (a,b) and 2 dpc (c-f). Panels (a-d) are blow-ups of root tips shown in Fig. 2a of the main text. Identical cells in (a,b), (c,d) and (e,f) are marked by numbers. Blue asterisks in (b) and (d) indicate GFP-expressing cells, as shown in (a) and (c); white arrowheads point to strong starch granule staining. Blue arrowheads in (f) point to two cells with starch granule staining and GFP expression, as seen in (e); bars, 50 μm.
Supplementary Figure 5. Regeneration of *scr* and *plt1plt2* after excision at 70 µm from the tip.
Time-lapse of confocal median longitudinal sections of single regenerating roots in *scr* (a) and *plt1plt2* (b) plants, after root-tip excision at 70 µm, at consecutive dpc; bars, 50 µm.
Note that QC and stem cells are removed in both cuts (0 dpc).
Supplementary Figure 6. Gravitropism recovery in absence of functional stem cells.
Frequency of gravitropic response scored at various days after excision at 70 µm from the tip, in wild type ecotype Ws (n=66) and in mutants plt1plt2 (n=136) and scr (n=48). In all cases a continuous increase of the fraction of gravitropic individuals can be observed until a plateau is reached; error bars, s.e.m.
Supplementary Figure 7. *PLT1* and *PLT2* expression during regeneration.
Time-lapse of confocal median longitudinal sections of single regenerating roots in the transcriptional fusion *pPLT1::CFP* (a) and the translational fusion *PLT2::GFP* (b); bars, 50 μm.
Supplementary Figure 8. No induction of QC-specific, PLT-dependent genes during regeneration.

The figure shows that genes downstream of PLT1 and PLT2 were not induced in the plt1plt2 double mutant by potential backup mechanisms that might function in regeneration. Expression map of the QC-enriched transcripts that are significantly down-regulated in plt1plt2 double mutant root-tips compared to wild type were first identified (n=16, PLT1/2 dependent markers). At left, expression levels of PLT1/2 dependent markers in cell types and tissues of uncut roots; at right, expression levels of the marker set in uncut tips and regenerating stump of wild type (top) or plt1plt2 (bottom) at the indicated time-points after excision. At 22 h none of the markers appears significantly (q < 5%) up-regulated either in the wild type or in the mutant stumps compared to the wild type at 0 h; colour-coded values of each cell of the expression maps, as in Fig 1. The lack of induction in WT regenerating roots at 24 implies that PLT1/2 dependent genes are not induced until later in regeneration. The lack of induction in the plt1plt2 mutant shows that these genes are not upregulated by alternate mechanisms during regeneration in the plt1plt2 mutant.
Supplementary Figure 9. Perturbation of auxin flow blocks regeneration.
Time-lapse of confocal median longitudinal section of single regenerating roots in DR5::GFP (a,b) and pWOX5::GFP (c,d), untreated (a,c) or transferred to 50 μM NPA after the excision (b,d), at consecutive dpc; bars, 50 μm.
The DR5 reporter shows a perturbation in the auxin distribution at the tip of the stumps transferred to NPA. After 2 dpc, the roots transferred on NPA do not regenerate any further.
Supplementary Table 1. Number of cell divisions detected in the median planes of roots expressing CYCB1;1::GFP translational fusion with destruction box (marking G2/M transition). Each tissue observed (epi, epidermis; cor, cortex; endo, endodermis; peri, pericycle; stele) was divided in three longitudinal zones: 0-50 μm, 50-100 μm and 100-150 μm from the point of excision. The total numbers of cells expressing CYCB1;1::GFP in each tissue/zone is pooled in this table, from all the uncut (n=7) and the regenerating (n=12) roots analyzed.

|         | 0-50 μm |         |         |         | 50-100 μm |         |         |         | 100-150 μm |         |         |         |
|---------|---------|---------|---------|---------|-----------|---------|---------|---------|-----------|---------|---------|---------|
|         | epi     | cor     | endo    | peri    | stele     | epi     | cor     | endo    | peri    | stele     | epi     | cor     | endo    |
| Uncut (n = 7) | 8       | 14      | 4       | 3       | 4         | 0       | 0       | 2       | 0       | 0         | 0       | 0       | 0       |
| Cut (n = 12)  | 0       | 9       | 15      | 9       | 12        | 6       | 12      | 8       | 4       | 2         | 6       | 7       | 3       | 2       | 5   |
**Supplementary Table 2.** All marker sets and gene lists described in the manuscript with probe identification and AGI number of the gene. The procedures used to generate each list are described in Methods Summary and Supplementary Methods.

| Columella-enriched marker set | 251081_at | AT5G02070 | 255637_at | AT4G00750 |
|-------------------------------|-----------|-----------|-----------|-----------|
| 245245_at AT1G44318           | 251293_at | AT3G61930 | 255645_at | AT4G00880 |
| 245250_at AT4G17490           | 251643_at | AT3G57550 | 255823_at | AT2G40470 |
| 245393_at AT4G16260           | 251739_at | AT3G56170 | 256319_at | AT1G35910 |
| 245528_at AT4G15530           | 251770_at | AT3G55970 | 256595_x_at AT3G28530 |
| 246097_at AT5G20270           | 251835_at | AT3G55180 | 256676_at | AT3G52180 |
| 246434_at AT5G17520           | 251906_at | AT3G53720 | 256720_at | AT2G34140 |
| 246682_at AT5G33290           | 252505_at | AT3G46170 | 257466_at | AT1G62840 |
| 246922_at AT5G25110           | 252606_at | AT3G45010 | 257722_at | AT3G18490 |
| 247610_at AT5G60630           | 253014_at | AT4G37940 | 258295_at | AT3G23400 |
| 247802_at AT5G58580           | 253113_at | AT4G35985 | 258683_at | AT3G08760 |
| 247874_at AT5G57710           | 253155_at | AT4G35720 | 259102_at | AT3G11660 |
| 247921_at AT5G57660           | 253217_at | AT4G34970 | 259150_at | AT3G10320 |
| 248431_at AT5G51470           | 253425_at | AT4G32190 | 259181_at | AT3G01690 |
| 248687_at AT5G48300           | 253791_at | AT4G28640 | 259235_at | AT3G11600 |
| 248819_at AT5G47050           | 253808_at | AT4G28300 | 259277_at | AT3G01180 |
| 248909_at AT5G45810           | 253936_at | AT4G26880 | 259527_at | AT1G12600 |
| 248926_at AT5G45880           | 253956_at | AT4G26700 | 259596_at | AT1G28130 |
| 248934_at AT5G46080           | 254027_at | AT4G25835 | 260248_at | AT1G74310 |
| 249420_at AT5G39820           | 254053_s_at AT4G25300 | 260456_at | AT1G72490 |
| 250062_at AT5G17760           | 254575_at | AT4G19460 | 260723_at | AT1G48070 |
| 250724_at AT5G06330           | 254754_at | AT4G13210 | 260925_at | AT1G21340 |
| 250802_at AT5G04970           | 254917_at | AT4G11350 | 260947_at | AT1G06020 |
| 250803_at AT5G04980           | 255070_at | AT4G09020 | 261100_at | AT1G63020 |
| 251039_at AT5G02020           | 255564_s_at AT4G01750 | 261142_at | AT1G19780 |
| Gene ID | Description                              | Gene ID | Description |
|--------|-------------------------------------------|--------|-------------|
| 261166_s_at | AT1G34570 | 250105_at | AT5G16630 |
| 261211_at  | AT1G12780 | 250326_at | AT5G12080 |
| 261260_at  | AT1G26680 | 245055_at | AT2G26470 |
| 261643_at  | AT1G27720 | 245130_at | AT2G45340 |
| 262213_at  | AT1G74870 | 245499_at | AT4G16480 |
| 262517_at  | AT1G17180 | 245793_at | AT1G32220 |
| 262548_at  | AT1G31280 | 246295_at | AT3G56690 |
| 262759_at  | AT1G10800 | 246426_at | AT5G17430 |
| 262959_at  | AT1G54290 | 246864_at | AT5G25900 |
| 263543_at  | AT2G21610 | 246983_at | AT5G67200 |
| 264312_at  | AT1G70450 | 247153_at | AT5G65700 |
| 264510_at  | AT1G09530 | 247163_at | AT5G65685 |
| 264682_at  | AT1G65570 | 247310_at | AT5G63950 |
| 264741_at  | AT1G62290 | 247985_at | AT5G56790 |
| 264775_at  | AT1G22880 | 248016_at | AT5G56380 |
| 264868_at  | AT1G24090 | 248091_at | AT5G55120 |
| 264929_at  | AT1G23160 | 248132_at | AT5G54840 |
| 26494_at   | AT1G23040 | 248209_at | AT5G53990 |
| 264956_at  | AT1G23210 | 248372_at | AT5G51850 |
| 265194_at  | AT1G05010 | 248696_at | AT5G48360 |
| 265245_at  | AT2G43060 | 248789_at | AT5G47440 |
| 265345_at  | AT2G22680 | 248938_at | AT5G45780 |
| 265354_at  | AT2G16700 | 249894_at | AT5G45140 |
| 266362_at  | AT2G32430 | 249080_at | AT5G43990 |
| 266391_at  | AT2G41290 | 249318_at | AT5G40870 |
| 266710_at  | AT2G46850 | 249803_at | AT5G23780 |
| 267300_at  | AT2G30140 | 249938_at | AT5G22330 |
| 267489_s_at| AT2G19120 | 250051_at | AT5G17800 |
| 267496_at  | AT2G30550 | 250079_at | AT5G16650 |
| Gene ID   | Gene ID   | Gene ID   | Gene ID   | Gene ID   |
|-----------|-----------|-----------|-----------|-----------|
| 256899_at | AT3G24660 | 264529_at | AT1G30820 | 257722_at | AT3G18490 |
| 256960_at | AT3G13510 | 265087_at | AT1G03760 | 260248_at | AT1G74310 |
| 256971_at | AT3G21100 | 265355_at | AT2G16760 | 262517_at | AT1G17180 |
| 256978_at | AT3G21110 | 265987_at | AT2G24240 | 264868_at | AT1G24090 |
| 257012_at | AT3G26120 | 266034_at | AT2G06005 | 267300_at | AT2G30140 |
| 257180_at | AT3G13180 | 266314_at | AT2G27040 | 267496_at | AT2G30550 |
| 257460_at | AT1G75580 | 266689_at | AT2G19930 |           |           |
| 257956_at | AT3G25400 | 266917_at | AT2G45830 |           |           |
| 257976_at | AT3G20840 | 267012_at | AT2G39220 |           |           |
| 258139_at | AT3G24520 | 267054_at | AT2G38370 |           |           |
| 258252_at | AT3G15720 |           |           |           |           |
| 258254_at | AT3G26780 |           |           |           |           |
| 258861_at | AT3G02060 |           |           |           |           |
| 259017_at | AT3G07310 | 245250_at | AT4G17490 | 245393_at | AT4G16260 |
| 259363_at | AT1G13270 | 245528_at | AT4G15530 | 247921_at | AT5G57660 |
| 259823_at | AT1G66250 | 246097_at | AT5G20270 | 250724_at | AT5G06330 |
| 260109_at | AT1G63260 | 246682_at | AT5G33290 | 254027_at | AT4G25835 |
| 260974_at | AT1G53440 | 247874_at | AT5G57710 | 259102_at | AT3G11660 |
| 261202_at | AT1G12910 | 248819_at | AT5G47050 | 259596_at | AT1G28130 |
| 262010_at | AT1G35612 | 251039_at | AT5G02020 | 260925_at | AT1G21340 |
| 262194_at | AT1G77930 | 251906_at | AT3G53720 | 264741_at | AT1G62290 |
| 262278_at | AT1G68640 |           |           | 264775_at | AT1G22880 |
| 262563_at | AT1G34210 | 252606_at | AT3G45010 | 265354_at | AT2G16700 |
| 262600_at | AT1G15340 | 253014_at | AT4G37940 | 266391_at | AT2G41290 |
| 262912_at | AT1G59740 | 253113_at | AT4G35985 |           |           |
| 263360_at | AT2G03830 | 254917_at | AT4G11350 |           |           |
| 263789_at | AT2G24560 | 255823_at | AT2G40470 |           |           |
| 263977_at | AT2G42660 | 256720_at | AT2G34140 |           |           |
| 264091_at | AT1G79110 | 257466_at | AT1G62840 |           |           |

**Columella markers induced at regeneration 13 hrs compared to regeneration 0 hrs**

| Gene ID   |
|-----------|
| 245250_at |
| 245528_at |
| 246097_at |
| 246682_at |
| 247874_at |
| 248819_at |
| 251039_at |
| 251906_at |
| 252606_at |
| 253014_at |
| 253113_at |
| 254917_at |
| 255823_at |
| 256720_at |
| 257466_at |

**Columella markers induced at regeneration 5 hrs compared to regeneration 0 hrs**

| Gene ID   |
|-----------|
| 247921_at |
| 250724_at |
| 254027_at |
| 259102_at |
| 259596_at |
| 260925_at |
| 264741_at |
| 264775_at |
| 244520_at |
| 250802_at |
| 251081_at |
| 253155_at |

**Columella markers induced at regeneration 22 hrs compared to regeneration 0 hrs**

| Gene ID   |
|-----------|
| 247610_at |
| 249420_at |
| 250802_at |
| 251081_at |
| 253155_at |
Genes in the starch metabolism pathway induced at regeneration 5 hrs

| Gene Probe ID | Gene Accession |
|---------------|----------------|
| 253217_at     | AT4G34970      |
| 253956_at     | AT4G26700      |
| 254053_s_at   | AT4G25300      |
| 254754_at     | AT4G13210      |
| 255070_at     | AT4G09020      |
| 255564_s_at   | AT4G01750      |
| 256676_at     | AT3G52180      |
| 257466_at     | AT1G62840      |
| 258295_at     | AT3G23400      |
| 259181_at     | AT3G01690      |
| 260456_at     | AT1G72490      |
| 260723_at     | AT1G48070      |
| 262959_at     | AT1G54290      |
| 264510_at     | AT1G09530      |
| 264892_at     | AT1G23160      |
| 264894_at     | AT1G23040      |
| 265194_at     | AT1G05010      |
| 266710_at     | AT2G46850      |

Intersection of Root and Callus competence markers

| Gene Probe ID | Gene Accession |
|---------------|----------------|
| 244984_at     | AT5G13520      |
| 245035_at     | AT2G26400      |
| 245055_at     | AT2G26470      |
| 245122_at     | AT2G47420      |
| 245130_at     | AT2G45340      |
| 245143_at     | AT2G45450      |
| 245144_at     | AT2G45240      |
| 245180_at     | AT5G12410      |
| 245194_at     | AT1G67820      |

PLT1/2 downstream markers that are also QC enriched

| Gene Probe ID | Gene Accession |
|---------------|----------------|
| 256861_at     | AT3G23920      |
| 264903_at     | AT1G23190      |
| 260207_at     | AT1G70730      |
| 248687_at     | AT5G48300      |
| 245180_at     | AT5G12410      |
| 245194_at     | AT1G67820      |

| Gene Probe ID | Gene Accession |
|---------------|----------------|
| 246060_at     | AT5G08420      |
| 246070_at     | AT5G20160      |
| 246088_at     | AT5G20600      |
| 246094_at     | AT5G19300      |
| 246103_at     | AT5G28640      |
| 246196_at     | AT4G37090      |
| 246212_at     | AT4G36930      |
| 246315_at     | AT3G56870      |
| 246317_at     | AT3G56900      |
| 246346_at     | AT3G56810      |
| Gene ID    | Description | Gene ID    | Description | Gene ID    | Description |
|------------|-------------|------------|-------------|------------|-------------|
| 246415_at  | AT5G17160   | 247039_at  | AT5G67270   | 247904_at  | AT5G57390   |
| 246457_at  | AT5G16750   | 247046_at  | AT5G66540   | 247943_at  | AT5G57170   |
| 246461_at  | AT5G16930   | 247063_at  | AT5G66820   | 247962_at  | AT5G56580   |
| 246478_at  | AT5G15980   | 247093_at  | AT5G66350   | 247988_at  | AT5G56910   |
| 246479_at  | AT5G16060   | 247167_at  | AT5G65850   | 248036_at  | AT5G55915   |
| 246505_at  | AT5G16250   | 247228_at  | AT5G65140   | 248093_at  | AT5G55210   |
| 246527_at  | AT5G15750   | 247241_at  | AT5G64680   | 248105_at  | AT5G55280   |
| 246538_at  | AT5G15520   | 247244_at  | AT5G64710   | 248154_at  | AT5G54400   |
| 246548_at  | AT5G14910   | 247247_at  | AT5G64650   | 248173_at  | AT5G54580   |
| 246559_at  | AT5G15550   | 247268_at  | AT5G64080   | 248178_at  | AT5G54370   |
| 246581_at  | AT1G31760   | 247277_at  | AT5G64420   | 248186_at  | AT5G53880   |
| 246610_at  | AT5G35400   | 247367_at  | AT5G63290   | 248299_at  | AT5G53080   |
| 246743_at  | AT5G27750   | 247449_at  | AT5G62290   | 248326_at  | AT5G52820   |
| 246765_at  | AT5G27330   | 247483_at  | AT5G62420   | 248357_at  | AT5G52380   |
| 246768_at  | AT5G27400   | 247497_at  | AT5G61770   | 248362_at  | AT5G52470   |
| 246794_s_at| AT5G27010   | 247520_at  | AT5G61310   | 248370_at  | AT5G52170   |
| 246809_s_at| AT5G27140   | 247555_at  | AT5G61020   | 248385_at  | AT5G51910   |
| 246842_at  | AT5G26731   | 247580_at  | AT5G61330   | 248404_at  | AT5G51460   |
| 246864_at  | AT5G25900   | 247603_at  | AT5G60930   | 248413_at  | AT5G51600   |
| 246882_at  | AT5G26180   | 247608_at  | AT5G60990   | 248431_at  | AT5G51470   |
| 246904_at  | AT5G25480   | 247610_at  | AT5G60630   | 248463_at  | AT5G51130   |
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| 246910_at  | AT5G25800   | 247670_at  | AT5G60190   | 248481_at  | AT5G50930   |
| 246920_at  | AT5G25090   | 247671_at  | AT5G60210   | 248547_at  | AT5G50280   |
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| 247009_at  | AT5G67600   | 247705_at  | AT5G59460   | 248678_at  | AT5G48870   |
| 247010_at  | AT5G67510   | 247745_at  | AT5G59030   | 248696_at  | AT5G48360   |
| 247015_at  | AT5G66960   | 247771_at  | AT5G58590   | 248710_at  | AT5G48480   |
| 247032_at  | AT5G67240   | 247818_at  | AT5G58370   | 248737_at  | AT5G48120   |
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248854_at   AT5G46580  250146_at   AT5G14660  250762_at   AT5G05990
248857_at   AT5G46640  250179_at   AT5G14440  250786_at   AT5G05540
248963_at   AT5G45700  250180_at   AT5G14450  250825_at   AT5G05210
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249253_at   AT5G42060  250225_at   AT5G14105  251022_at   AT5G02150
249258_at   AT5G41650  250227_at   AT5G13830  251067_at   AT5G01910
249425_at   AT5G39790  250228_at   AT5G13840  251070_at   AT5G01940
249426_at   AT5G39840  250284_at   AT5G13290  251092_at   AT5G01470
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249821_at   AT5G23690  250372_at   AT5G11460  251206_at   AT3G63090
249826_at   AT5G23310  250394_at   AT5G10910  251313_at   AT3G61360
249859_at   AT5G22840  250413_at   AT5G11160  251355_at   AT3G61100
249886_at   AT5G22320  250418_at   AT5G11240  251366_at   AT3G61340
249901_at   AT5G22650  250426_at   AT5G10510  251371_at   AT3G60360
249954_at   AT5G18920  250489_s_at   AT5G09710  251378_at   AT3G60660
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249975_s_at AT5G18790  250529_at   AT5G08610  251486_at   AT3G59540
249993_at   AT5G18570  250538_at   AT5G08620  251525_at   AT3G59000
250027_at   AT5G18250  250546_at   AT5G08180  251539_at   AT3G58690
250075_at   AT5G17670  250711_at   AT5G06110  251558_at   AT3G57810
| Gene 1   | Gene 2   | Gene 3   | Gene 4   | Gene 5   |
|---------|---------|---------|---------|---------|
| 254626_at | AT4G18400 | 255782_at | AT1G19850 | 257005_at | AT3G14190 |
| 254628_at | AT4G18593 | 255934_at | AT1G12740 | 257115_at | AT3G20150 |
| 254649_at | AT4G18570 | 255968_at | AT1G22270 | 257131_at | AT3G20240 |
| 254748_at | AT4G13120 | 256065_at | AT1G07070 | 257132_at | AT3G20230 |
| 254778_at | AT4G12750 | 256077_at | AT1G18090 | 257140_at | AT3G28910 |
| 254800_at | AT4G13070 | 256125_at | AT1G18250 | 257153_at | AT3G27220 |
| 254831_at | AT4G12600 | 256140_at | AT1G48650 | 257188_at | AT3G13150 |
| 254955_at | AT4G10920 | 256204_at | AT1G50840 | 257229_at | AT3G16490 |
| 254964_at | AT4G11080 | 256248_at | AT3G66652 | 257290_at | AT3G15560 |
| 254975_at | AT4G10500 | 256270_at | AT3G12300 | 257334_at |              |
| 254986_at | AT4G10640 | 256274_at | AT3G12080 | 257352_at | AT2G34900 |
| 254991_at | AT4G10620 | 256288_at | AT3G12270 | 257395_at | AT2G15630 |
| 255018_at | AT4G10090 | 256302_at | AT1G69526 | 257398_at | AT2G01990 |
| 255035_at | AT4G09550 | 256320_at | AT3G12170 | 257426_at | AT1G54850 |
| 255176_s_at | AT4G07950 | 256373_at | AT1G66740 | 257460_at | AT1G75580 |
| 255227_at | AT4G05440 | 256438_s_at | AT3G11120 | 257483_at | AT1G49620 |
| 255278_at | AT4G04940 | 256447_at | AT1G33440 | 257487_at | AT1G71850 |
| 255449_at | AT4G02820 | 256612_at | AT3G29280 | 257648_at | AT3G16840 |
| 255535_at | AT4G01790 | 256652_at | AT3G18850 | 257652_at | AT3G16810 |
| 255542_at | AT4G01860 | 256654_at | AT3G18880 | 257658_at | AT3G13230 |
| 255544_at | AT4G01880 | 256750_at | AT3G27150 | 257694_at | AT3G12860 |
| 255557_at | AT4G01990 | 256754_at | AT3G25690 | 257724_at | AT3G18510 |
| 255583_at | AT4G01510 | 256794_at | AT3G22230 | 257725_at | AT3G18525 |
| 255597_at | AT4G01730 | 256797_at | AT3G18600 | 257740_at | AT3G27330 |
| 255650_s_at | AT4G00930 | 256864_at | AT3G23890 | 257815_at | AT3G25130 |
| 255685_s_at | AT4G00600 | 256881_at | AT3G26410 | 257897_at | AT3G18030 |
| 255729_at | AT1G25470 | 256890_at | AT3G23830 | 258009_at | AT3G19440 |
| 255759_at | AT1G16790 | 256910_at | AT3G24080 | 258028_at | AT3G27473 |
| 255767_at | AT1G16740 | 256950_at | AT3G19080 | 258067_at | AT3G25980 |
| Gene ID | Description |
|--------|-------------|
| 258074_at | AT3G25890 |
| 258098_at | AT3G23870 |
| 258106_at | AT3G23580 |
| 258135_at | AT3G24506 |
| 258166_at | AT3G21540 |
| 258202_at | AT3G13940 |
| 258252_at | AT3G15720 |
| 258284_at | AT3G16080 |
| 258292_at | AT3G23330 |
| 258296_at | AT3G23390 |
| 258297_at | AT3G23325 |
| 258299_at | AT3G23410 |
| 258318_at | AT3G22680 |
| 258376_at | AT3G17680 |
| 258397_at | AT3G15357 |
| 258462_at | AT3G17350 |
| 258477_at | AT3G02680 |
| 258480_at | AT3G02640 |
| 258502_at | AT3G02490 |
| 258505_at | AT3G06530 |
| 258521_at | AT3G06680 |
| 258522_at | AT3G06660 |
| 258526_at | AT3G06790 |
| 258530_at | AT3G06840 |
| 258534_at | AT3G06730 |
| 258538_at | AT3G06950 |
| 258576_at | AT3G04230 |
| 258630_at | AT3G02820 |
| 258859_at | AT3G02120 |
260824_at AT1G06720 261951_at AT1G64490 262777_at AT1G13030
260827_at AT1G06740 261972_at AT1G64600 262906_at AT1G59760
260872_at AT1G21350 262000_at AT1G33810 262941_at AT1G79490
260895_at AT1G29250 262001_at AT1G33790 262953_at AT1G75670
260898_at AT1G29070 262056_at AT1G80245 263017_at AT2G17620
260945_at AT1G05950 262112_at AT1G02870 263039_at AT1G23280
260957_at AT1G06080 262118_at AT1G02850 263239_at AT2G16570
261002_at AT1G26520 262206_at AT2G01090 263264_at AT2G38810
261019_at AT1G26470 262222_at AT1G74700 263369_at AT2G20480
261023_at AT1G12200 262278_at AT1G68640 263371_at AT2G20490
261178_at AT1G04760 262336_at AT1G64220 263375_s_at AT2G20530
261207_at AT1G12830 262338_at AT1G64185 263420_at AT2G17240
261262_at AT1G26760 262402_at AT1G49410 263427_at AT2G22260
261294_at AT1G48430 262410_at AT1G34770 263435_at AT2G28600
261364_at AT1G53140 262411_at AT1G34640 263441_at AT2G28620
261368_at AT1G53070 262416_at AT1G49390 263447_s_at AT2G31640
261377_at AT1G18850 262434_at AT1G47670 263474_at AT2G31725
261401_at AT1G79640 262494_at AT1G21810 263481_at AT2G40405
261406_at AT1G18800 262534_at AT1G17040 263585_at AT2G25210
261524_at AT1G14300 262538_at AT1G17140 263607_at AT2G16270
261618_at AT1G33110 262539_at AT1G17200 263679_at AT1G59990
261660_at AT1G18370 262544_at AT1G15425 263777_at AT2G46450
261738_s_at AT1G47820 262584_at AT1G15440 263824_at AT2G40360
261750_at AT1G76120 262586_at AT1G15480 263843_at AT2G37020
261780_at AT1G76310 262594_at AT1G15250 263960_at AT2G36200
261840_at AT1G16070 262618_at AT1G06560 263974_at AT2G42720
261859_at AT1G50490 262699_at AT1G75980 264025_at AT2G21050
261898_at AT1G80720 262752_at AT1G16330 264048_at AT2G22400
261911_at AT1G80750 262758_at AT1G10780 264118_at AT1G79140
| Gene ID  | Accession 1 | Accession 2 | Accession 3 | Accession 4 | Accession 5 |
|---------|-------------|-------------|-------------|-------------|-------------|
| 264128_at | AT1G79190   | 265171_at   | AT1G23790   | 266579_at   | AT2G23930    |
| 264131_at | AT1G79150   | 265189_at   | AT1G23840   | 266641_at   | AT2G35605    |
| 264173_at | AT1G02160   | 265274_at   | AT2G28450   | 266655_at   | AT2G25880    |
| 264175_at | AT1G02050   | 265326_at   | AT2G18220   | 266687_at   | AT2G19670    |
| 264177_at | AT1G02150   | 265339_at   | AT2G18230   | 266790_at   | AT2G28950    |
| 264179_at | AT1G02180   | 265442_at   | AT2G20940   | 266806_at   | AT2G30000    |
| 264203_at | AT1G22780   | 265468_at   | AT2G37210   | 266822_at   | AT2G44860    |
| 264265_at | AT1G09280   | 265518_at   | AT2G06040   | 266893_at   | AT2G26070    |
| 264317_at | AT1G70310   | 265519_at   | AT2G06030   | 266903_at   | AT2G34570    |
| 264337_at | AT1G70350   | 265596_at   | AT2G20020   | 266916_at   | AT2G45860    |
| 264352_at | AT1G03270   | 265614_at   | AT2G25355   | 266948_at   | AT2G18850    |
| 264357_at | AT1G03360   | 265724_at   | AT2G32100   | 267004_at   | AT2G34260    |
| 264377_at | AT2G25060   | 265730_at   | AT2G32220   | 267075_at   | AT2G41070    |
| 264465_at | AT1G10230   | 265742_at   | AT2G01290   | 267102_at   | AT2G41500    |
| 264471_at | AT1G67120   | 265831_at   | AT2G14460   | 267174_at   | AT2G37600    |
| 264553_s_at | AT1G09480   | 265847_at   | AT2G35750   | 267232_at   | AT2G44190    |
| 264678_at | AT1G09760   | 265865_at   | AT2G01740   | 267276_at   | AT2G30130    |
| 264689_at | AT1G09900   | 266009_at   | AT2G37420   | 267309_at   | AT2G19385    |
| 264731_at | AT1G62150   | 266076_at   | AT2G40700   | 267312_at   | AT2G34750    |
| 264803_at | AT1G08580   | 266079_at   | AT2G37860   | 267314_at   | AT2G34730    |
| 264821_at | AT1G03470   | 266093_at   | AT2G37990   | 267371_at   | AT2G44510    |
| 264846_at | AT2G17850   | 266135_at   | AT2G45100   | 267402_at   | AT2G26180    |
| 264895_at | AT1G23100   | 266180_at   | AT2G02470   | 267430_at   | AT2G34860    |
| 264897_at | AT1G23220   | 266223_at   | AT2G28790   | 267474_at   | AT2G02740    |
| 264971_at | AT1G67210   | 266225_at   | AT2G28900   | 267506_at   | AT2G45520    |
| 265006_at | AT1G61570   | 266237_at   | AT2G29540   | 267507_at   | AT2G45710    |
| 265082_at | AT1G03830   | 266335_at   | AT2G32440   | 267529_at   | AT2G45490    |
| 265147_at | AT1G51380   | 266427_at   | AT2G07170   | 267561_at   | AT2G45590    |
| 265154_at | AT1G30960   | 266511_at   | AT2G47680   | 267636_at   | AT2G42110    |
Intersection of Root, Callus, and Leaf Competence Markers

| Probe ID | Gene ID       | Log2 Fold Change |
|----------|---------------|------------------|
| 247671_at| AT5G60210     | 251483_at        |
| 247943_at| AT5G57170     | 251486_at        |
| 247962_at| AT5G56580     | 251539_at        |
| 244984_at| AT5G55280     | 251778_at        |
| 245180_at| AT5G12410     | 248186_at        |
| 245494_at| AT4G16390     | 248299_at        |
| 245523_at| AT4G15910     | 248385_at        |
| 245612_at| AT4G14440     | 248404_at        |
| 245739_at| AT1G44110     | 248413_at        |
| 245800_at| AT1G46264     | 248473_at        |
| 245849_at| AT5G13520     | 248678_at        |
| 246060_at| AT5G08420     | 248696_at        |
| 246088_at| AT5G20600     | 248963_at        |
| 246346_at| AT3G56810     | 248975_at        |
| 246415_at| AT5G17160     | 249138_at        |
| 246505_at| AT5G16250     | 249425_at        |
| 246538_at| AT5G15520     | 249659_s_at      |
| 246548_at| AT5G14910     | 249700_at        |
| 246768_at| AT5G27400     | 249826_at        |
| 246906_at| AT5G25475     | 249993_at        |
| 246920_at| AT5G25090     | 250180_at        |
| 247010_at| AT5G67510     | 250228_at        |
| 247032_at| AT5G67240     | 250284_at        |
| 247039_at| AT5G67270     | 250371_at        |
| 247046_at| AT5G66540     | 250372_at        |
| 247268_at| AT5G64080     | 250413_at        |
| 247580_at| AT5G61330     | 250758_at        |
| 247603_at| AT5G60930     | 251113_at        |
| 247608_at| AT5G60990     | 251184_at        |
| AT4G31840 | AT3G14190 | 259563_s_at | AT1G20590 |
| AT4G31290 | AT3G20150 | 259592_at | AT1G27950 |
| AT4G30840 | AT3G20230 | 259760_at | AT1G77580 |
| AT4G30800 | AT3G28910 | 259763_at | AT1G77630 |
| AT4G30220 | AT2G34900 | 259894_at | AT1G71430 |
| AT4G29410 | AT1G54850 | 259912_at | AT1G72670 |
| AT4G26500 | AT3G18525 | 259978_at | AT1G76540 |
| AT4G24750 | AT3G18030 | 260028_at | AT1G29980 |
| AT4G23800 | AT3G25980 | 260209_at | AT1G68550 |
| AT4G20130 | AT3G23670 | 260329_at | AT1G80370 |
| AT4G18400 | AT3G24506 | 260368_at | AT1G69700 |
| AT4G18570 | AT3G23390 | 260404_at | AT1G69950 |
| AT4G11080 | AT3G23410 | 260502_at | AT1G47270 |
| AT4G09550 | AT3G17680 | 260565_at | AT2G43800 |
| AT4G01730 | AT3G02640 | 260682_at | AT1G17510 |
| AT1G25470 | AT3G06680 | 260683_at | AT1G17560 |
| AT1G16790 | AT3G06660 | 260817_at | AT1G06900 |
| AT1G16740 | AT3G06840 | 260872_at | AT1G21350 |
| AT1G19850 | AT3G02820 | 260898_at | AT1G29070 |
| AT1G07070 | AT3G02120 | 260957_at | AT1G06080 |
| AT1G18090 | AT3G01410 | 261364_at | AT1G53140 |
| AT1G18250 | AT3G04920 | 261660_at | AT1G18370 |
| AT3G12080 | AT3G02210 | 261780_at | AT1G76310 |
| AT3G12170 | AT3G09150 | 261859_at | AT1G50490 |
| AT3G11120 | AT3G01160 | 261911_at | AT1G80750 |
| AT3G29280 | AT3G11500 | 262000_at | AT1G33810 |
| AT3G18850 | AT3G11520 | 262434_at | AT1G47670 |
| AT3G23890 | AT3G05060 | 262494_at | AT1G21810 |
| AT3G23830 | AT1G13270 | 262538_at | AT1G17140 |
Transcription Factors in the intersection list of Root, Callus and Leaf markers

All genes significantly induced or repressed in regenerating tissue at 5 hours post-cutting
| Gene Symbol     | Accession       | Accession       | Accession       | Accession       |
|----------------|-----------------|-----------------|-----------------|-----------------|
| 247985_at      | AT5G56790       | 250994_at       | AT5G02490       | 254361_at       | AT4G22212       |
| 247989_at      | AT5G56350       | 251287_at       | AT3G61820       | 254559_at       | AT4G19200       |
| 248068_at      | AT5G55610       | 251513_at       | AT3G59220       | 255039_at       | AT4G09570       |
| 248101_at      | AT5G55200       | 251640_at       | AT3G57450       | 255064_at       | AT4G08950       |
| 248419_at      | AT5G51550       | 251895_at       | AT3G54420       | 255261_s_at     | AT4G05110       |
| 248582_at      | AT5G49910       | 252070_at       | AT3G51680       | 255430_at       | AT4G03320       |
| 248611_at      | AT5G49520       | 252195_at       | AT3G50190       | 255524_at       | AT4G02330       |
| 248686_at      | AT5G48540       | 252198_x_at     | AT3G50250       | 255647_at       | AT4G00900       |
| 248710_at      | AT5G48480       | 252437_at       | AT3G47380       | 255727_at       | AT1G25510       |
| 248789_at      | AT5G47440       | 252751_at       | AT3G43430       | 255782_at       | AT1G19850       |
| 248819_at      | AT5G47050       | 252956_at       | AT4G38580       | 255955_at       | AT1G22030       |
| 249237_at      | AT5G42050       | 252988_at       | AT4G38410       | 256100_at       | AT1G13750       |
| 249310_at      | AT5G41520       | 252997_at       | AT4G38400       | 256442_at       | AT3G10930       |
| 249388_at      | AT5G40090       | 253008_at       | AT4G38210       | 256543_at       | AT1G42480       |
| 249459_at      | AT5G39580       | 253100_at       | AT4G37400       | 256720_at       | AT2G34140       |
| 249580_at      | AT5G37740       | 253101_at       | AT4G37430       | 256806_at       | AT3G20910       |
| 249814_at      | AT5G23840       | 253113_at       | AT4G35985       | 257087_at       | AT3G20500       |
| 249894_at      | AT5G22580       | 253203_at       | AT4G34710       | 257142_at       | AT3G20090       |
| 249971_at      | AT5G19110       | 253292_at       | AT4G33985       | 257611_at       | AT3G26580       |
| 249983_at      | AT5G18470       | 253485_at       | AT4G31800       | 258062_at       | AT3G26000       |
| 249988_at      | AT5G18310       | 253571_at       | AT4G31000       | 258108_at       | AT3G23570       |
| 250199_at      | AT5G14180       | 253581_at       | AT4G30660       | 258764_at       | AT3G10720       |
| 250270_at      | AT5G12980       | 253627_at       | AT4G30650       | 258941_at       | AT3G09940       |
| 250277_at      | AT5G12940       | 253712_at       | AT4G29330       | 259021_at       | AT3G07540       |
| 250296_at      | AT5G12020       | 254042_at       | AT4G25810       | 259069_at       | AT3G11710       |
| 250350_at      | AT5G12010       | 254061_at       | AT4G25360       | 259293_at       | AT3G11580       |
| 250358_at      | AT5G11740       | 254076_at       | AT4G25340       | 259342_at       | AT3G03890       |
| 250426_at      | AT5G10510       | 254085_at       | AT4G24960       | 259426_at       | AT1G01470       |
| 250469_at      | AT5G10130       | 254293_at       | AT4G23060       | 259592_at       | AT1G27950       |
| Gene ID       | Description                          | Gene ID       | Description                          |
|--------------|--------------------------------------|--------------|--------------------------------------|
| 259604_at    | AT1G56450                            | 263865_at    | AT2G36910                            |
| 259656_at    | AT1G55200                            | 263977_at    | AT2G42660                            |
| 260023_at    | AT1G30040                            | 264000_at    | AT2G22500                            |
| 260028_at    | AT1G29980                            | 264131_at    | AT1G79150                            |
| 260225_at    | AT1G74590                            | 264188_at    | AT1G54690                            |
| 260350_at    | AT1G69410                            | 264254_at    | AT1G09150                            |
| 260386_at    | AT1G74010                            | 264299_s_at  | AT1G78860                            |
| 260406_at    | AT1G69920                            | 264415_at    | AT1G43160                            |
| 260438_at    | AT1G68290                            | 264436_at    | AT1G10370                            |
| 260528_at    | AT2G47260                            | 264645_at    | AT1G08940                            |
| 260551_at    | AT2G43510                            | 264752_at    | AT1G23010                            |
| 260556_at    | AT2G43620                            | 264953_at    | AT1G77120                            |
| 260602_at    | AT1G55920                            | 265276_at    | AT2G28400                            |
| 260842_at    | AT1G29150                            | 265422_at    | AT2G20800                            |
| 261227_at    | AT1G20200                            | 265442_at    | AT2G20940                            |
| 261648_at    | AT1G27730                            | 265670_s_at  | AT2G32210                            |
| 261728_at    | AT1G76160                            | 265674_at    | AT2G32190                            |
| 261756_at    | AT1G08320                            | 265683_at    | AT2G24400                            |
| 261858_at    | AT1G50570                            | 265740_at    | AT2G01150                            |
| 261865_at    | AT1G50430                            | 266119_at    | AT2G02100                            |
| 261933_at    | AT1G22410                            | 266168_at    | AT2G38870                            |
| 262001_at    | AT1G33790                            | 266458_at    | AT2G47710                            |
| 262041_at    | AT1G80100                            | 266461_at    | AT2G47730                            |
| 262458_at    | AT1G11280                            | 266485_at    | AT2G47630                            |
| 262517_at    | AT1G17180                            | 266581_at    | AT2G46140                            |
| 262766_at    | AT1G13160                            | 266712_at    | AT2G46750                            |
| 263153_s_at  | AT1G54010                            | 266743_at    | AT2G02990                            |
| 263553_at    | AT2G16430                            | 266746_s_at  | AT2G02930                            |
| 263736_at    | AT1G60000                            | 266846_at    | AT2G25970                            |

*Genes shown to be induced by auxin and induced in regenerating tissue within 24hrs*
267300_at AT2G30140
245304_at AT4G15630
245501_at AT4G15620
248968_at AT5G45280
250907_at AT5G03670
258075_at AT3G25900
258764_at AT3G10720
259426_at AT1G01470
265272_at AT2G28350
267008_at AT2G39350
267300_at AT2G30140
267590_at AT2G39700
245304_at AT4G15630
253579_at AT4G30610
252988_at AT4G38410
259426_at AT1G01470
259841_at AT1G52200
263216_s_at AT1G30720
SUPPLEMENTARY METHODS

Plants and Microscopy: *Arabidopsis thaliana* ecotypes Wassilewskija (Ws), Columbia (Col) and C24 were used. Origins and ecotypes of mutant and transgenic lines are as follows: CycB1;1::GFP translational fusion\(^1,2\) (Col, courtesy of P. Doerner), \(pWOX5::GFP\)\(^3\) (Col, courtesy of R. Heidstra and B. Scheres), \(plt1-1plt2-4\)\(^4\) and \(scr-4\)\(^5,6\) (both Ws, courtesy of B. Scheres), \(DR5::GFP\) is \(DR5rev::GFP\)\(^7\) (Col, TAIR cs9361), \(PIN1::GFP\) translational fusion\(^8\) (Col, TAIR cs9362), \(PIN2::GFP\) translational fusion\(^9\) (Col, courtesy of J. Friml), \(PIN7::GFP\) translational fusion\(^3\) (Col, courtesy of J. Friml), \(PET111\)\(^10\) (Col, courtesy of B. Scheres), J0571 (C24, Haseloff GAL4GFP lines [http://www.plantsci.cam.ac.uk/Haseloff/biosystems/Arabidopsis/fluorescent.htm](http://www.plantsci.cam.ac.uk/Haseloff/biosystems/Arabidopsis/fluorescent.htm)), E3754 (Col, Poethig GAL4GFP lines [http://enhancertraps.bio.upenn.edu](http://enhancertraps.bio.upenn.edu)).

Seeds were sterilized in 50% household bleach (Sodium Hypochlorite, 5%) for 3 minutes and rinsed six times in sterile water. Standard germination procedures were on 0.8% agar solid medium (1X MS, 0.5% sucrose, 0.05% MES, pH 5.7), on square plates kept in vertical position in a growth chamber (Percival, CU36L5; 22 °C, light intensity 35 \(\mu\)mol/m\(^2\)sec, on a 6 h/18 h darkness/light cycle). Lugol staining was performed with 25% Lugol solution (Riedel-deHaën) for 2 min, followed by clearing with chloral hydrate:glycerol:water = 8:1:3 (w:v:v) for 4 min, rinsed, mounted in water and imaged with Nomarski optics (Nikon, Eclipse 90i). For confocal images of live single roots, the plantlet was transferred from the standard solid media to a microscope slide and mounted with filter-sterilized 10 % \(\mu\)g/ml propidium iodide (PI) to stain cell walls (red signal), and visualized with a confocal laser scanning system (Leica, DMRE microscope equipped with TCS SP2). After image acquisition, the same plantlet was transferred back to the standard solid medium and returned to the growth chamber. To visualize GFP and lugol staining in the same root (Fig. 2a and Supplementary Fig.4), the plantlet was first mounted on 5 % \(\mu\)g/ml PI and imaged under confocal microscopy; subsequently, without moving the plant or the cover-slip, a paper-tissue (Kimwipes,
Kimberly-Clark) was used to absorb the PI from one side of the cover-slip while from the opposite side a clearing: Lugol = 1:1 solution (see above) was allowed to seep under the cover-slip by capillary action. After about 10 minutes of clearing and staining, the root was visualized under Nomarski optics.

**Root Excisions and RNA Isolation:** All root-tip excisions were performed at 4 dpg. To cut roots, plantlets were transferred onto a plate with 5.0% agar solid medium (1X MS, 0.5% sucrose, 0.05% MES, pH 5.7) and root-tips were cut by hand with a 30G sterile dental needle (ExcelInt) under a dissecting microscope (Nikon, SMZ645 at 75X magnification). The plantlets were then returned to the standard 0.8% agar solid medium and returned to the growth chamber for recovery. Excisions were performed at 130 μm from the tip unless otherwise stated. For microarray analysis, 130 μm of the tip was cut off to initiate regeneration and then 70 μm of regenerating stumps were excised for sampling of regenerating tissue at various time points; sets of 5 tissue samples were collected in 2.5 μl of extraction buffer (XB) of the Pico Pure RNA Isolation Kit (Arcturus), flash-frozen in liquid nitrogen and ground with micropestels mounted on a small electric drill. At least 25 samples were pooled for each experimental replicate (4 replicates). Isolated total RNA was double-amplified using the Eukaryotic Small Sample Target Labeling Assay (Affymetrix), and hybridized to the ATH-121501 full genome Arabidopsis microarray (Affymetrix).

**Gravitropic Assay:** Square plates with standard 0.8% agar solid medium (see above) were placed in a vertical position and oriented so that plantlet roots (either cut or uncut) were perpendicular to the gravity vector. Positive gravitropic response was scored when the root-tip showed a re-alignment with the gravity vector (approximately 90° bent from the initial root direction). The frequency of regeneration is defined as the fraction of the plants that showed root regeneration at 6 dpc, measured by positive gravitropic response and confirmed by root-tip morphology.
Cell-cycle and auxin transport inhibitions: In hydroxyurea (HU) treatments (cell-cycle inhibition), seeds were germinated in standard plates, transferred at 2 dpg to standard media supplemented with HU at the indicated concentration. Roots were left undisturbed for another 11 days, cut (or not) and then rotated for the gravitropism assay; gravitropism was scored at 3 dpc. In L-Buthionine-sulfoximine (BSO) treatments (cell-cycle inhibition), seeds were germinated on standard media already containing the indicated concentration of BSO, cut at 4 dpg and rotated for the gravitropism assay; gravitropism was scored at 3 dpc. In 1-N-naphthylphthalamic acid (NPA) treatments (auxin efflux inhibitor), seeds were germinated as described, cut at 4 dpg and immediately transferred to standard solid medium containing 50 μM NPA.

Leaf Excision: Third and fourth rosette leaves were used for excisions, at 4 or 14 days after leaf emergence. These time-points approximately correspond to leaf developmental stages sampled at 9 and 22 days after sowing used in the transcriptional profiling of first and second rosette leaves. Leaves were cut in half approximately perpendicular to the midvein with Vannas micro-scissors (World Precision Instruments, 15 μm straight blades). Regenerating leaves were imaged with a dissecting microscope (Leica, MZ16F).

Microarray and Statistical Analysis. Microarray profiles were normalized using the MAS 5.0 method with a target intensity of 250. Cell type-specific markers sets were generated by identifying transcripts whose signal was significantly enriched in a given cell type compared to all other cell types, using Significance Analysis of Microarrays (SAM) with a false discovery rate (q) cut-off < 5% and a two-fold enrichment cut off. To increase stringency for cell specificity and assure no overlap between columella and QC markers, we also required a two fold enrichment in columella average signal over the average signal in each of the other cell types of the root-tip (for example, columella markers were two-fold enriched over QC and lateral root cap individually). The same procedure was followed for QC markers, ensuring a two-fold enrichment over columella
and lateral root cap. In addition, the root-tip specific cell types also needed to show a two-fold enrichment in root-tip over proximal meristem expression.

For analysis of percent columella and QC identity recovery, ranked gene expression was tested for a significant fit to modelled expression patterns representing an increase in expression at either 5 h, 13 h, or 22 h using the quantitative function of SAM (q < 5%). For example, genes that increase significantly at the 5 h regeneration time point fit the pattern 1 2 2 2, where 1 represents expression of replicates at time 0 and 2 represents replicates at the subsequent time points of regeneration (5,13, and 22 h). The rank method in SAM was used.

For evaluating \textit{PLT} downstream markers, a two-class unpaired test in SAM (q < 5%) was used to find QC markers significantly down-regulated in the \textit{plt1plt2} mutant tips compared to wild type tips (termed the \textit{PLT1/2} dependent set). Subsequent analysis tested whether any members of the \textit{PLT1/2} dependent set were significantly up-regulated in wild type (WT) stumps at 0 h vs. WT stumps at 24 h (testing for early regulation of \textit{PLT1/2} dependent set in WT) or WT stumps at 0 h vs. \textit{plt1plt2} stumps at 24 h (testing for potential regulation of the \textit{PLT1/2} dependent set in the \textit{plt1plt2} mutant during regeneration, \textit{i.e.}, alternate regulatory mechanisms) using the two-class unpaired test in SAM (q < 5%).

Lists of competence markers for root, callus, and leaves were generated sequentially and the intersection of each set was taken. To generate root competence markers, a two-class unpaired test in SAM was performed to find genes significantly up-regulated in tissue freshly harvested at 130-200 μm (competent zone) vs. tissue freshly harvested at 270-340 μm (non-competent zone) with a q < 5%. This procedure yielded 1,538 genes (root competence markers). To identify competence markers in tissue explants undergoing auxin treatment to generate callus, a quantitative analysis in SAM (q < 5%) was used querying for genes that showed a monotonic increase in the callus induction
samples over days 0, 2, 4, 7 and 10 on Callus Inducing Media (CIM) with data from using the rank method so that replicates for each time point were labelled: 1, 2, 3, 4, 5 respectively (callus competent markers). The intersection of the root and callus competent sets was 647 genes. To identify potential competence markers in leaf, genes significantly up-regulated in 9-day-old leaves vs. to 22-day-old leaves (with data from) were determined using a two-class unpaired test in SAM (q < 5%) (leaf competent markers). The intersection of the root, callus, and leaf competent marker sets was 209 genes.

To find all genes that were significantly regulated in regenerating stumps 5 hours after tip-cutting, we used a two-class unpaired test in SAM (q < 5%) comparing replicates in regenerating tips at 0 h vs. 5 h. We found the intersection of that list and the list of auxin-induced genes from to generate the list of genes induced at 5 h after tip cutting that were also induced by auxin. Among the genes that were differentially regulated in root stumps in the first five hours after cutting (n=182, Supplementary Table 2), 22 have been shown to respond to auxin.

Expression Maps: Clustering and visualization steps were performed in Matlab version 7.3.0. In summary, the color-coded value of each cell is the log2 of the ratio between the signal of the cell (average of replicates) and the average for its row. In Fig.1, left and right panels are normalized separately, in this way.

Genes were clustered on the regenerating stump profiles (0-22 h) using the 'clustergram' routine in Matlab using the Pearson correlation distance metric and an average linkage method. The row ordering from that clustering procedure was then imposed on the cell specific heat-maps to maintain the same order of genes between the cell-specific and the regeneration time course heat-maps. In the map of Fig. 3, each series was row normalized separately, so that separate row means were calculated for root, callus, and leaf experiments. The 647 genes that represented the intersection of root and callus
competence markers were mapped in Fig. 3. The Matlab colormap is available upon request.

SUPPLEMENTARY NOTES

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