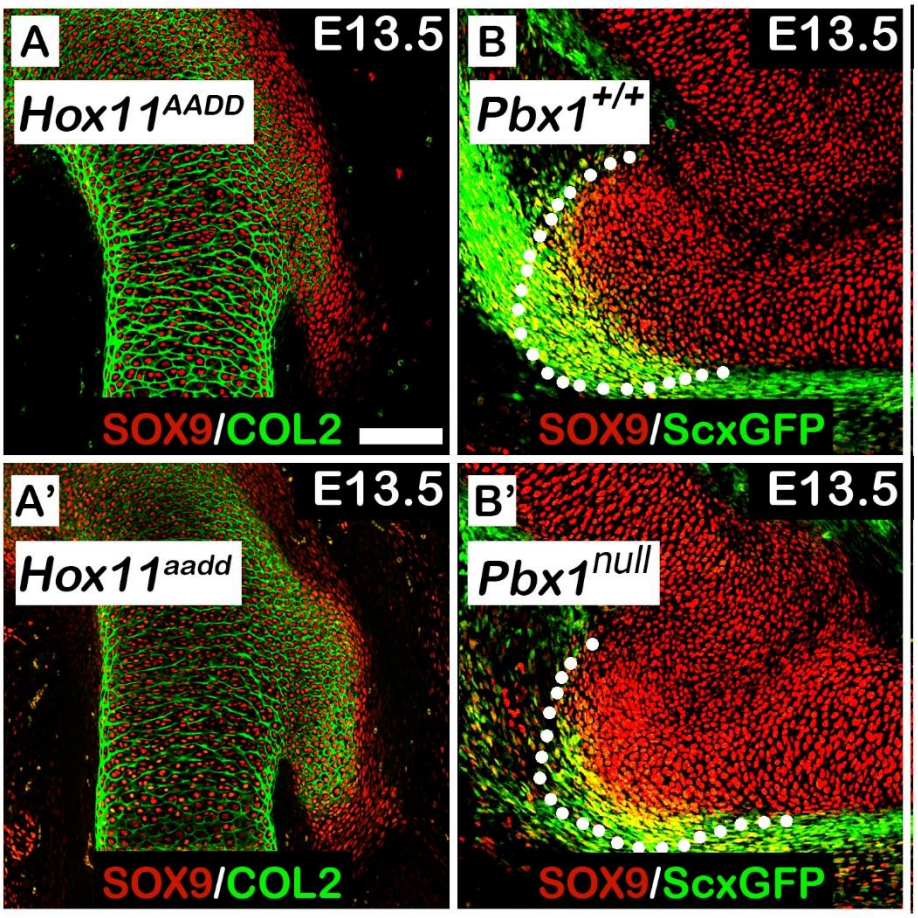


Figure S1. *Pbx1* and *Hox11*^{aadd} do not regulate patterning of distal or proximal superstructures, respectively. (A, A') Sagittal sections through the humeri of *Hox11*^{aadd} mutant and control embryos at E13.5 that were stained against SOX9 and COL2A1. **(B, B')** Sagittal sections through the elbows of *Pbx1* mutant and control embryos at E13.5 that were crossed to *ScxGFP* transgenic mice and stained against SOX9. Whereas *HoxA11* and *HoxD11* regulated the spatial organization of distal olecranon precursors, organization of the proximal DT precursors was unaffected in *Hox11*^{aadd} compound mutants (A, A'). Conversely, whereas *Pbx1* regulated the spatial organization of proximal DT precursors, organization of the distal olecranon precursors was unaffected in *Pbx1*^{null} mutants (B, B'). Scale bars: 100 µm.

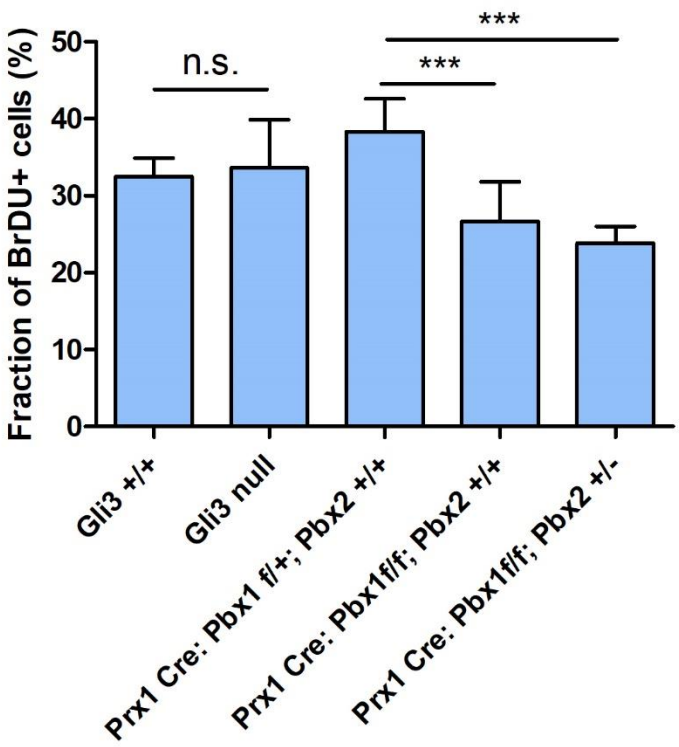
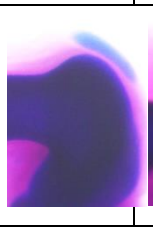
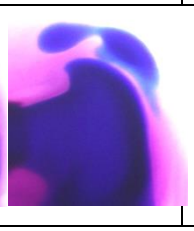


Figure S2. Quantification and comparison of proliferating cells among proximal humeral superstructure precursors in *Gli3* and *Prx-Cre:Pbx1;Pbx2* control and mutant embryos. Paraffin sections taken from E13.5 *Gli3* and *Prx1-Cre;Pbx1;Pbx2* control and mutant forelimbs were immunostained for BrdU. The number of total *Sox9*$^{+}$ and *Sox9*$^{+}$/BrdU^{+} cells were counted in the region of the greater and deltoid tuberosity and the fractions of proliferating cells were calculated for both control and mutant embryos (n≥6). Whereas proliferation in both *Prx1-Cre;Pbx1*^{floxed} and *Prx1-Cre;Pbx1*^{floxed}*;Pbx2*^{het} mutant embryos was significantly decreased, *Gli3*^{null} embryos did not display significant changes in proliferation compared to control embryos. Statistical significance was determined as $p \leq 0.05$.

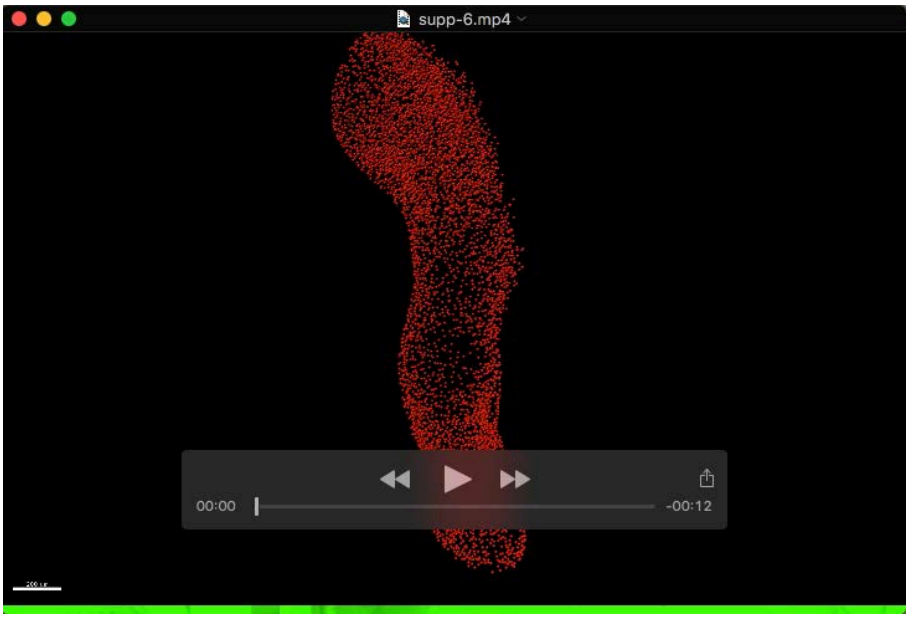
Table S1. Quantification of *Gli3*^{null} morphological variations within the deltoid tuberosity, patella and tibia.

Age (n)	Deltoid tuberosity		Patella			Tibia
	Severe/detached	Mild/dysplastic	Absent	Smaller	Deformed	Absent
E15.5 (4)	3/4	1/4	4/4	0/4	0/4	4/4
E17.5 (8)	3/8	5/8	0/4	5/8	3/8	8/8
						

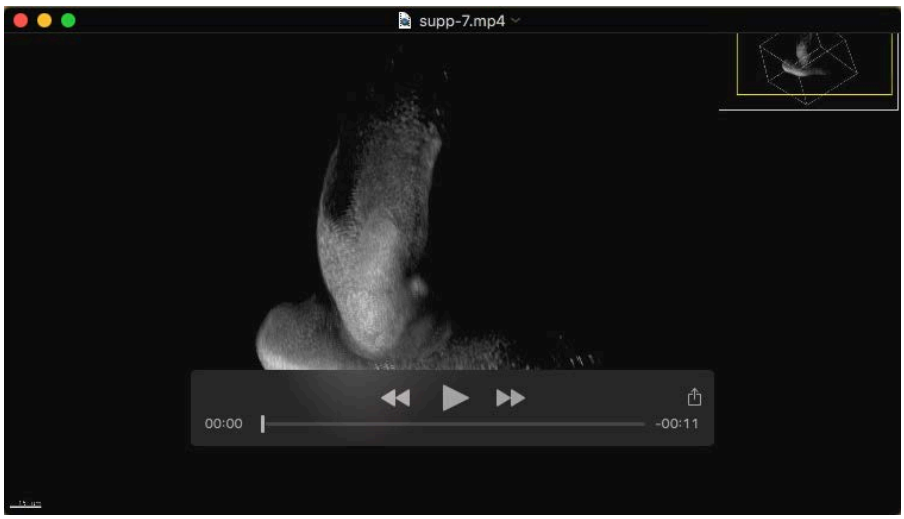
Deltoid tuberosity morphologies were divided into two categories, namely severe or mild dysplasia. Detached deltoid tuberosity was categorized as severe phenotype. Patella morphologies were divided into three categories, namely absent, smaller or deformed. The tibia was absent in all *Gli3* mutant embryos.

gene	Ole_vs_D dChange	Ole_vs_D rrected)	gene	Ole_vs_D dChange	Ole_vs_D rrected)	gene	Ole_vs_D T.log2Fol	Ole_vs_D rrected)	gene	Ole_vs_D T.log2Fol	Ole_vs_D rrected)	gene	Ole_vs_D T.log2Fol	Ole_vs_D rrected)	gene	Ole_vs_D T.log2Fol	Ole_vs_D rrected)
Npy	-4.14865	5.04E-14	Hoxaas2	-1.11522	0.000141	Piezo1	-0.8432	0.001444	Hs6st1	-0.56647	0.01525	Fgfrl1	0.675382	0.001835	Mia	1.065361	1.88E-09
Hoxc5	-3.7619	5.04E-14	Col14a1	-1.10778	0.000289	Gamt	-0.83972	9.01E-05	Lamb1	-0.56498	0.009119	Cercam	0.677161	0.04345	Scx	1.071125	5.04E-14
Pitx2	-3.40387	5.04E-14	Ephb1	-1.10589	0.000111	Stard8	-0.83715	0.020722	Cfl2	-0.56227	0.041523	Ldha	0.681572	7.82E-07	Cadps2	1.076673	0.000412
Actc1	-3.20499	5.04E-14	Pid1	-1.10563	5.15E-05	Cxcl12	-0.83612	1.88E-09	Glipr2	-0.56217	0.001409	Cpe	0.682582	0.015563	Fam181b	1.080127	3.09E-05
Hoxc4	-3.1742	5.04E-14	Ank1	-1.09477	0.000349	Coro2b	-0.8359	0.010618	Mmp2	-0.55566	0.000881	Ier5	0.683161	0.001059	Slc14a2	1.087374	0.000321
Hoxa5	-3.00293	5.04E-14	Tubb2b	-1.0942	3.30E-13	Fgf1	-0.83508	0.010452	Elovl1	-0.55458	0.036416	Impa2	0.696762	0.029668	Chadl	1.090667	1.47E-05
Hoxc6	-2.94419	5.04E-14	Six2	-1.09252	1.45E-08	Fyn	-0.83302	0.000187	Bicc1	-0.55326	0.026149	Gmds	0.697403	0.002805	Tmem158	1.093016	5.21E-07
Hoxb4	-2.83826	5.04E-14	Dio3	-1.09081	0.000522	Nrp2	-0.83106	4.51E-05	Taglln2	-0.55235	0.013264	Pdha2	0.699812	0.005201	Socs2	1.100538	2.35E-07
Hoxb5	-2.77666	5.04E-14	Map1b	-1.08749	1.46E-09	Tpm1	-0.83093	3.12E-10	Efnb1	-0.54829	0.001308	Dhrs3	0.702593	0.010107	Acan	1.104008	0.00037
Adh1	-2.73869	5.04E-14	Vstm4	-1.08716	0.000168	Dmpk	-0.82753	0.015288	Grn	-0.54821	0.00252	Nr2f2	0.704658	0.014864	Unc5c	1.113077	5.50E-07
C1qtnf3	-2.71199	5.04E-14	Trp53i11	-1.08379	7.58E-05	Ntm	-0.82514	0.017984	Esyt1	-0.54255	0.024136	Gja3	0.705013	0.018824	Map2	1.121435	0.000281
Hoxa2	-2.46059	5.04E-14	Adamts2	-1.08344	0.000233	Il33	-0.82234	0.012867	Numbl	-0.54054	0.025656	Dkk3	0.705282	0.02282	Pthlh	1.126021	0.000237
Hoxb5os	-2.45086	5.04E-14	Nes	-1.08146	2.41E-05	Pkdcc	-0.82192	5.66E-08	Pbx1	-0.53703	0.005073	Tmem151	0.707782	0.004259	Rarg	1.130266	3.56E-09
Crh	-2.396	5.04E-14	Ggta1	-1.07999	0.000408	Slit2	-0.82173	0.022101	Cdo1	-0.53485	0.033155	Snx18	0.714725	0.007901	Gpr4	1.137559	1.37E-05
Pax1	-2.37227	5.04E-14	Cd82	-1.07892	0.000301	Bdh2	-0.82013	0.003544	Adamts15	-0.53097	0.033155	Trappc6a	0.715238	0.008449	Stmn2	1.138868	5.20E-05
Hoxa4	-2.33988	5.04E-14	Irx5	-1.07578	0.000669	Peg3	-0.81911	0.000701	Zfp503	-0.52912	0.020501	Pax9	0.717446	0.027249	Homer2	1.146975	5.44E-06
Acta2	-2.33381	5.04E-14	Peg10	-1.06925	4.02E-06	Myof	-0.81095	0.011443	Tmem164	-0.52657	0.034722	Atoh8	0.727935	0.024875	Snai1	1.149585	1.59E-07
Pgm5	-2.24275	5.04E-14	Cnrip1	-1.06859	0.000701	Dok5	-0.80985	0.028825	Tmem176a	-0.52489	0.03091	Gabpb1	0.727994	0.032698	Mfsd2a	1.161992	0.000149
Meis1	-2.23013	5.04E-14	Svil	-1.06677	1.35E-05	Stom	-0.80716	0.008513	Tmsb4x	-0.49897	0.009033	Fam53b	0.72981	0.026509	Fmod	1.16736	1.98E-07
Vgll2	-2.20856	5.04E-14	Figf	-1.0659	0.000593	Ebf2	-0.80343	1.50E-05	Ppp1r14b	-0.49572	0.005254	Dusp9	0.740969	0.033682	Bnip3	1.185673	8.45E-09
Hspb1	-2.09953	5.04E-14	Rgcc	-1.05882	5.66E-08	Parm1	-0.79795	0.032995	Smarca2	-0.47594	0.049617	Tbx18	0.744128	0.004147	Foxp2	1.187366	5.69E-06
Myod1	-2.09621	5.04E-14	Nr2f1	-1.05836	2.31E-07	S100b	-0.79775	0.033384	Tril	-0.47508	0.019169	Egfem1	0.753228	0.014064	Mab21l1	1.189824	8.82E-07
Msc	-2.05679	5.04E-14	Myl4	-1.05777	0.000743	Mchr1	-0.79479	0.007287	Uchl1	-0.47111	0.014064	Fli1	0.77029	0.016903	Kera	1.19097	8.81E-05
Hoxb6	-2.02519	9.90E-14	Tekt1	-1.05703	0.000912	Khk	-0.79352	0.020876	Nfib	-0.46959	0.003622	Id1	0.775467	2.81E-09	Pla2g16	1.231173	1.71E-05
Tnnt1	-1.98928	5.04E-14	Itih5	-1.05262	0.000829	Hoxa7	-0.79188	0.019597	Lgals1	-0.46322	0.001008	Csrnp3	0.77552	0.042075	Foxp1	1.234903	7.74E-11
Akap12	-1.95538	2.87E-13	Vat1l	-1.04861	0.000796	Ngfr	-0.78849	0.000412	Cox5b	-0.44225	0.004221	Tsc22d1	0.777454	1.19E-08	Islr2	1.248121	2.41E-06
Meis2	-1.95349	5.04E-14	Ptx3	-1.04742	5.55E-06	Arap1	-0.78456	0.009942	S1pr3	-0.43545	0.032249	Nrn1	0.780919	0.024243	Wwp2	1.250581	5.08E-12
Hoxb3	-1.9064	2.08E-12	Tbx1	-1.04644	0.000418	Anxa6	-0.78283	2.20E-08	Hic1	-0.43128	0.013129	Ism1	0.786397	0.037828	Twist2	1.255425	5.04E-14
Steap4	-1.90467	2.71E-12	Plat	-1.0451	0.000149	Meis3	-0.78182	0.033751	Prdx5	-0.42273	0.045141	Dnm3os	0.788617	0.03676	Wnt4	1.279919	2.03E-07
Hoxb2	-1.8741	1.46E-13	Fam43a	-1.03576	0.001115	Parp3	-0.78125	0.028844	Ccnd3	-0.4169	0.017178	Net1	0.789193	1.38E-05	Slc16a3	1.286563	8.67E-13
Cyp26a1	-1.81865	4.14E-11	Npdc1	-1.01509	5.81E-05	AI427809	-0.77737	0.017178	Crabp1	-0.40585	0.019732	Gli2	0.790571	0.015753	Foxc2	1.287162	1.56E-07
Igfbp3	-1.77634	5.04E-14	Cd34	-1.01257	0.001847	Eya1	-0.77412	0.015086	Mest	-0.37197	0.010379	Col9a3	0.790986	9.05E-05	Bcl11a	1.288705	2.02E-12
Myog	-1.75108	2.52E-10	Gm266	-1.01183	0.000928	Tspan9	-0.77049	0.000153	Grb10	-0.36865	0.036539	Vill	0.791305	0.008503	Erg	1.300808	3.60E-06
Gsn	-1.74188	5.04E-14	Crym	-1.00868	0.001918	Taglln	-0.76802	0.025922	Rpl37	-0.36694	0.027873	Wnt5b	0.792157	0.00379	Ifitm1	1.303875	9.57E-06
Hoxa3	-1.72379	1.47E-10	Rnase4	-1.00682	0.000427	Fam65b	-0.76646	0.025656	Tuba1a	-0.34288	0.045141	Csrp2	0.792453	1.75E-08	Pdlim5	1.310951	7.85E-06
Clu	-1.70541	5.04E-14	Cdh4	-1.00332	1.99E-05	Zic4	-0.76581	0.007205	H3f3a	0.374398	0.026118	Fgfr2	0.79413	0.007196	Pianp	1.313589	1.45E-07
Wnt2	-1.69363	1.30E-09	Foxd1	-1.00001	0.001693	Kazald1	-0.76569	0.005575	H2afy	0.377258	0.038491	Smad7	0.80138	0.00296	Nog	1.330085	5.85E-07
Gpx3	-1.65373	5.04E-14	Ntn1	-0.99896	0.000931	Fam107a	-0.7651	0.010384	Blmh	0.388884	0.043729	Enpp6	0.802485	0.016846	Glcci1	1.36999	7.73E-09
Gfra2	-1.62987	1.09E-09	Cd248	-0.99462	3.02E-11	Chrna1	-0.76178	0.015753	Eif3h	0.388893	0.018187	Zic2	0.803449	0.016696	Mecom	1.393335	9.44E-10
Flnc	-1.61634	5.04E-14	Tmem8c	-0.9946	0.002183	Tnnt2	-0.75967	0.015235	Wbp5	0.412723	0.023669	Pgk1	0.80412	2.81E-09	Clec14a	1.396226	9.89E-07
Hoxc8	-1.61596	8.86E-09	Tubb2a	-0.99279	3.95E-09	Triobp	-0.75779	0.000321	Oat	0.436722	0.024136	Sema3d	0.806984	0.029668	Sox5	1.409572	5.19E-07
Zic1	-1.61358	8.74E-09	Nrgn	-0.98913	0.002644	Camk2d	-0.75724	0.030155	Pgam1	0.439751	0.009237	Fhl1	0.813508	0.000632	Frzb	1.411773	1.83E-07
Gm7325	-1.61041	1.00E-08	Acta1	-0.98642	0.002432	Pea15a	-0.75676	5.30E-06	Tbx15	0.44224	0.041085	Barx2	0.814198	0.011067	Hsd11b2	1.421657	2.52E-10
Irx3	-1.60624	1.26E-08	Atp6v0e2	-0.98256	0.002865	Pitx3	-0.75624	0.015225	Flrt2	0.446039	0.033388	Daam2	0.819057	0.004492	LOC10263(	1.426985	3.13E-07
Hotairm1	-1.58553	1.48E-08	Ddit4l	-0.98247	0.001444	Fgf18	-0.7556	0.000666	H1f0	0.454752	0.007642	Thbd	0.819832	0.019401	Crlf1	1.436459	5.04E-14
Plxna2	-1.56123	1.49E-09	Scara3	-0.98158	6.84E-06	Col6a1	-0.75456	0.000197	Pcdh18	0.457701	0.028632	Fzd9	0.819922	0.012133	Col9a1	1.43882	5.04E-14
Nefl	-1.53946	4.71E-08	Ar4c	-0.97569	0.000395	Basp1	-0.75369	2.15E-08	Tpi1	0.458481	0.001949	Nfatc2	0.822727	0.022843	Ndufa4l2	1.463201	2.91E-07
Dner	-1.52669	8.00E-08	Kcne4	-0.97198	0.003263	Hoxaas3	-0.75087	0.027873	Serinc2	0.459176	0.049898	Kcns1	0.827682	0.023329	2010111l0	1.475706	4.57E-10
Hoxd4	-1.5248	7.61E-08	Lama4	-0.95807	2.56E-05	Thbs2	-0.74956	0.032546	H1fx	0.464144	0.007771	Plxna4	0.836653	0.017559	Nfatc1	1.492291	2.14E-12
Fmo1	-1.49238	7.78E-08	Sfrp1	-0.95796	7.19E-06	Nav1	-0.74846	0.005624	Alyref	0.468202	0.009572	Clec16a	0.839975	0.018069	Foxd2	1.527609	1.46E-08
Wscd1	-1.48045	1.77E-07	Gfra1	-0.94846	0.000916	Klf3	-0.74465	0.030886	Ptma	0.477984	0.001012	Prdm16	0.844208	0.004504	Sox9	1.541474	5.04E-14
Gas6	-1.48029	1.31E-08	Chst5	-0.9483	0.004859	Col1a2	-0.74447	1.58E-07	Rcc2	0.484415	0.013518	Ccnd1	0.847479	2.20E-07	Lhx2	1.542686	2.96E-08
Pcdh19	-1.47432	1.07E-08	Tmem132(	-0.9451	0.004199	Plxdc2	-0.74382	0.017371	Flnb	0.491029	0.033918	Dusp6	0.847692	0.00148	Col9a2	1.553318	5.04E-14
Cdh15	-1.4737	1.59E-07	Tnni1	-0.94114	0.004718	Cryab	-0.74001	0.031684	Tuba1c	0.491049	0.011118	Chst3	0.848159	0.018312	Gsc	1.557811	5.04E-14
Gap43	-1.43557	5.04E-14	Tbxa2r	-0.9311	0.005952	Tmem132(	-0.73845	0.009422	Fam162a	0.491473	0.009572	Tnfaip8	0.850588	0.000145	Sall1	1.567371	2.77E-08
Rspo1	-1.41586	7.81E-07	Anxa2	-0.92527	6.48E-11	Gm5868	-0.73745	0.014328	Fosb	0.494283	0.028848	Robo2	0.85196	0.01162	Hoxd13	1.584908	1.78E-08
Vstm2b	-1.41494	2.35E-08	Heyl	-0.91911	0.006824	Srpx2	-0.73039	0.019954	Ube2e3	0.495704	0.019558	Aff3	0.86089	4.93E-06	Cyp26b1	1.596352	2.56E-11
Plagl1	-1.40243	5.60E-09	Tnmd	-0.91596	0.007771	Haglr	-0.72545	0.030764	Tmem119	0.502177	0.00507	Hoxd12	0.865959	0.002225	Tbx5	1.615946	5.04E-14
Postn	-1.40097	2.54E-08	Shisa3	-0.91408	0.000427	Slc9a3r1	-0.71913	0.043111	Clic4	0.50486	0.021086	Mllt3	0.86686	0.014722	Hoxa11os	1.629353	1.88E-09
Ptn	-1.39025	8.35E-13	A730056A(	-0.91236	0.005052	Atp2a1	-0.71743	0.047553	Syt11	0.50576	0.027862	Mdfic	0.866917	0.011726	Matn4	1.631548	5.04E-14
Col6a2	-1.37945	5.04E-14	Nrp1	-0.91108	0.000719	Timp1	-0.71314	0.026118	Malat1	0.508217	0.001893	Cd24a	0.8725	5.69E-06	Col2a1	1.74921	5.04E-14
Lgals9	-1.37673	1.97E-06	Glt8d2	-0.90405	0.007993	Hba-x	-0.71144	0.0387	Bcl2	0.514153	0.008503	Wnt5a	0.87707	2.34E-06	Mab21l2	1.782025	5.04E-14
Syt13	-1.36886	3.80E-07	Col3a1	-0.9039	8.44E-09	Dpysl3	-0.71071	0.015086	H19	0.522744	0.000748	Scrg1	0.881622	0.009356	Foxc1	2.076666	5.04E-14
Svep1	-1.36563	7.62E-07	Ano1	-0.90138	0.004682	Fn1	-0.70884	5.87E-06	Tgfbi	0.52566	0.002856	Ets2	0.88352	2.16E-06	Gdf5	2.29113	5.04E-14
Cdc42ep2	-1.36407	9.15E-07	Smtnl2	-0.90103	0.000824	Prkar1b	-0.70466	0.023308	Foxp4	0.526602	0.047613	Fam131b	0.884216	0.011267	Fam101a	2.407492	5.04E-14
Igf1	-1.36361	5.04E-14	Spats2l	-0.89944	0.000171	Acaa2	-0.698	0.000652	Mcm2	0.54642	0.009033	Kank1	0.891498	0.004112	Hoxd9	2.639226	5.04E-14
Serpine2	-1.35826	5.04E-14	Lhfpl2	-0.89827	2.30E-06	Lrig1	-0.6881	0.045781	Bex2	0.55307	0.010379	Jarid2	0.892586	0.000379	Hand2	2.749165	5.04E-14
Kcne1l	-1.33441	6.40E-08	Fbn1	-0.89731	2.59E-06	Bace1	-0.68703	0.008509	Cyr61	0.557498	0.000852	Zcchc18	0.89577	0.002933	Hoxa10	2.853947	5.04E-14
Hlx	-1.33331	1.74E-06	Lrrc17	-0.89338	1.50E-06	Klhdc10	-0.68475	9.50E-05	Sdc1	0.564101	0.002008	Ebf1	0.90054	3.44E-05	Hoxd10	3.712281	5.04E-14
Des	-1.3053	5.39E-06	Penk	-0.8925	0.009777	Slc16a2	-0.68376	0.002269	Ccnd2	0.566114	0.001052	Prg4	0.904095	0.001693	Hoxa11	3.912635	5.04E-14
Ppap2b	-1.30458	5.04E-14	Tgfb1i1	-0.89036	0.00038	Fxyd1	-0.6815	0.029565	Cited2	0.568292	0.038171	Lrba	0.904467	0.000829	Hoxd11	4.010877	5.04E-14
Prss35	-1.30032	5.38E-07	Tpcn1	-0.88996	0.000377	Ptprd	-0.67934	0.001386	Sox4	0.573401	0.000516	Cdc42ep3	0.914357	0.000522			
Dlk1	-1.29504	5.04E-14	Meox1	-0.88883	1.48E-05	Mrln	-0.67612	0.036466	Osr2	0.574355	0.021055	Rasl11b	0.916729	7.72E-05			
Ajap1	-1.29481	1.09E-05	Clec11a	-0.88469	0.008528	Ttc7	-0.67538	0.034662	Gdf10	0.574398	0.048796	Slc2a1	0.922531	3.19E-06			
Igfbp5	-1.26855	5.04E-14	Rbp1	-0.88453	4.13E-08	Zcchc24	-0.66948	0.00065	Capn6	0.574801	0.000106	Cpa2	0.929801	0.006285			
AI464131	-1.2668	2.09E-05	Grin3a	-0.88422	0.010379	Tnc	-0.66676	0.000354	Igsf3	0.578321	0.004318	Hs3st3b1	0.932301	7.20E-06			
Lrrtm3	-1.26498	1.81E-05	Gpr83	-0.88349	0.009881	Laptm4b	-0.66609	4.66E-05	Lmo4	0.58901	0.003073	Id4	0.935525	0.001084			
Hvcn1	-1.25243	8.19E-07	Rbpms	-0.87893	0.006857	Spry4	-0.66608	0.021043	Sulf1	0.595077	0.034861	Nrtn	0.94418	0.000295			
Tmeff2	-1.23383	2.16E-05	Thbs4	-0.87843	0.000321	Pcp4	-0.65612	0.035431	Gas2	0.599087	0.001142	Pfkl	0.946876	3.13E-07			
Ly6h	-1.22634	7.93E-12	S100a6	-0.87621	0.001511	Col26a1	-0.64558	0.000129	Farp1	0.602039	0.002226	Gdf6	0.954545	0.004055			
Tpm2	-1.21633	3.03E-10	Cisd3	-0.87564	0.01058	Ptges	-0.6445	0.034662	Ctbp2	0.614214	0.002508	Smox	0.969756	2.54E-05			
Myl1	-1.2085	6.90E-05	Serping1	-0.8751	0.000746	Sepp1	-0.63918	0.026	Scin	0.617509	0.046702	Lrig3	0.972987	1.94E-06			
Egfl6	-1.1945	2.62E-05	Ly6e	-0.87322	1.59E-07	Col1a1	-0.63584	0.047842	Tyro3	0.618095	0.02339	Ndrg2	0.977635	0.000124			
Rpl39l	-1.19224	8.80E-05	Itgap2	-0.87223	0.009942	Aebp2	-0.63357	0.015803	Itm2a	0.620855	0.000116	Lect1	0.977845	1.25E-05			
Ackr4	-1.18912	2.41E-05	Txnip	-0.87146	0.000297	S100a10	-0.63016	0.000215	Mex3b	0.62202	0.010686	Tbx4	0.983826	0.002856			
AW551984	-1.18616	2.59E-07	Ramp2	-0.86803	0.002932	Mvk	-0.62493	0.012296	Ackr3	0.628746	0.033155	Papss2	0.984647	0.001004			
Ifi27	-1.18237	3.16E-06	Zfhx3	-0.86788	5.50E-07	Add3	-0.61815	0.00507	Pcdh10	0.632481	0.047327	Trib1	1.002989	1.43E-08			
Itga6	-1.18208	0.000108	Hmx1	-0.86761	0.001983	Vim	-0.61321	1.16E-06	Jun	0.63271	5.07E-05	5930403L1	1.005165	0.000698			
Prokr1	-1.17951	9.69E-05	Phlda1	-0.86711	1.17E-08	Celf2	-0.61009	0.045206	Ascc1	0.640592	0.022444	Sox11	1.005667	5.04E-14			
Plxnc1	-1.17256	0.000123	Sdk1	-0.86687	0.014693	Igfbp2	-0.60989	0.000404	Btg1	0.643941	0.015643	Bend4	1.009564	0.00132			
Mylpf	-1.15771	0.000137	Grp	-0.86451	0.005907	Jup	-0.60962	0.033602	Lxn	0.644596	0.026309	Trps1	1.010589	7.58E-05			
Kitl	-1.15206	0.000112	Osr1	-0.86404	1.98E-07	Sparc	-0.60701	1.61E-05	Tenm4	0.660081	0.03142	Shox2	1.012385	5.86E-07			
Kcnip1	-1.15201	6.27E-05	Efemp1	-0.86285	0.015288	Il17rd	-0.60034	0.02605	Lhfp	0.660688	0.015772	Cd83	1.013476	0.001142			
Crmp1	-1.14628	8.46E-05	C1qtnf7	-0.85586	0.012819	Zwint	-0.59467	0.013316	Higd1a	0.661005	0.000357	Sox6	1.028687	0.000384			
Rgma	-1.14476	9.60E-07	Nid2	-0.85501	2.05E-06	Serpinf1	-0.59108	0.001444	Tgfb2	0.661542	0.009777	Hoxa9	1.031524	0.000171			
Syn2	-1.13519	7.81E-05	Hivep2	-0.85252	0.017371	Hoxd3	-0.5893	0.04554	Ldhb	0.666405	1.70E-05	Stxbp6	1.033618	0.000317			
Ehd2	-1.12788	0.00015	Cmtm3	-0.84921	1.26E-08	Degs1	-0.5858	0.017178	Wif1	0.670551	0.030512	Angptl2	1.039218	4.11E-07			
Col5a2	-1.12115	1.16E-09	Ttyh2	-0.84803	0.002687	Fndc5	-0.58109	0.034688	Dusp26	0.675252	0.037677	Spsb4	1.049216	7.58E-05			

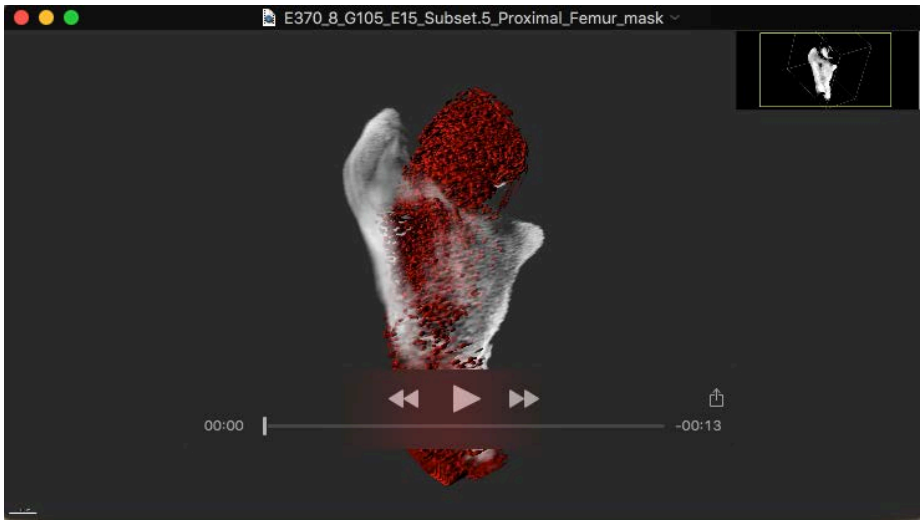
Table S2. List of 561 differentially expressed genes between proximal and distal *Sox9*$^+$/*Scx*$^+$ superstructure progenitors. Pink columns indicate gene names. Green columns indicates fold change in expression levels between distal olecranon *Sox9*$^+$/*Scx*$^+$ precursors and proximal deltoid tuberosity *Sox9*$^+$/*Scx*$^+$ precursors. Orange columns indicate *p*-value after adjustment with the fdrtool package.



Movie 1. *Sox9*$^{+}$*/Scx*$^{+}$ progenitors contribute extensively to humeral morphology. This movie shows a three-dimensional (3D) reconstruction of a humerus and various protruding superstructures. Reconstruction was made from stacked images of E14.5 forelimbs from *Sox9-Cre*^{ER}*-tdTomato* transgenic embryos using Arivis Vision4D (Arivis) and Imaris (Bitplane) software. Forelimb was additionally stained against COL2A1 to label the outer surface of the long bone. Whereas first-wave *Sox9*$^{+}$ progenitors were labeled by tdTomato, the secondary wave of *Sox9*$^{+}$/*Scx*$^{+}$ progenitors remained tdTomato-negative and contributed exclusively to superstructure formation, including bone eminences such as greater, lesser and deltoid tuberosities and various condyles, such as distal, medial and lateral humeral epicondyles.



Movie 2. *Sox9*$^{+}$*/Scx*$^{+}$ progenitors contribute extensively to elbow morphology. This movie shows a 3D reconstruction of the elbow and various protruding superstructures. Reconstruction was made from stacked images of E15.5 forelimbs from *Col2a1-Cre*^{ER}-*tdTomato* transgenic embryos using Arivis Vision4D (Arivis) and Imaris (Bitplane) software. Forelimb was additionally stained against COL2A1 to label the outer surface of the long bone. Whereas first-wave *Sox9*$^{+}$ progenitors were labeled by tdTomato, the secondary wave of *Sox9*$^{+}$/*Scx*$^{+}$ progenitors remained tdTomato-negative and contributed exclusively to superstructure formation, including protrusions such as the olecranon and various condyles, such as distal, medial and lateral humeral epicondyles.



Movie 3. *Sox9*$^{+}$*/Scx*$^{+}$ progenitors contribute extensively to femoral morphology. This movie shows a 3D reconstruction of the proximal femur and various protruding superstructures. Reconstruction was made from stacked images of E15.5 hindlimbs from *Col2a1-Cre*^{ER}*-tdTomato* transgenic embryos using Arivis Vision4D (Arivis) and Imaris (Bitplane) software. Hindlimb was additionally stained against COL2A1 to label the outer surface of the long bone. Whereas first-wave *Sox9*$^{+}$ progenitors were labeled by tdTomato, the secondary wave of *Sox9*$^{+}$/*Scx*$^{+}$ progenitors remained tdTomato-negative and contributed exclusively to superstructure formation, including bone eminences such as the greater, lesser and third trochanters.