

**Supplementary Data for:**

**iSyTE 2.0: a database for expression-based gene discovery in the eye**

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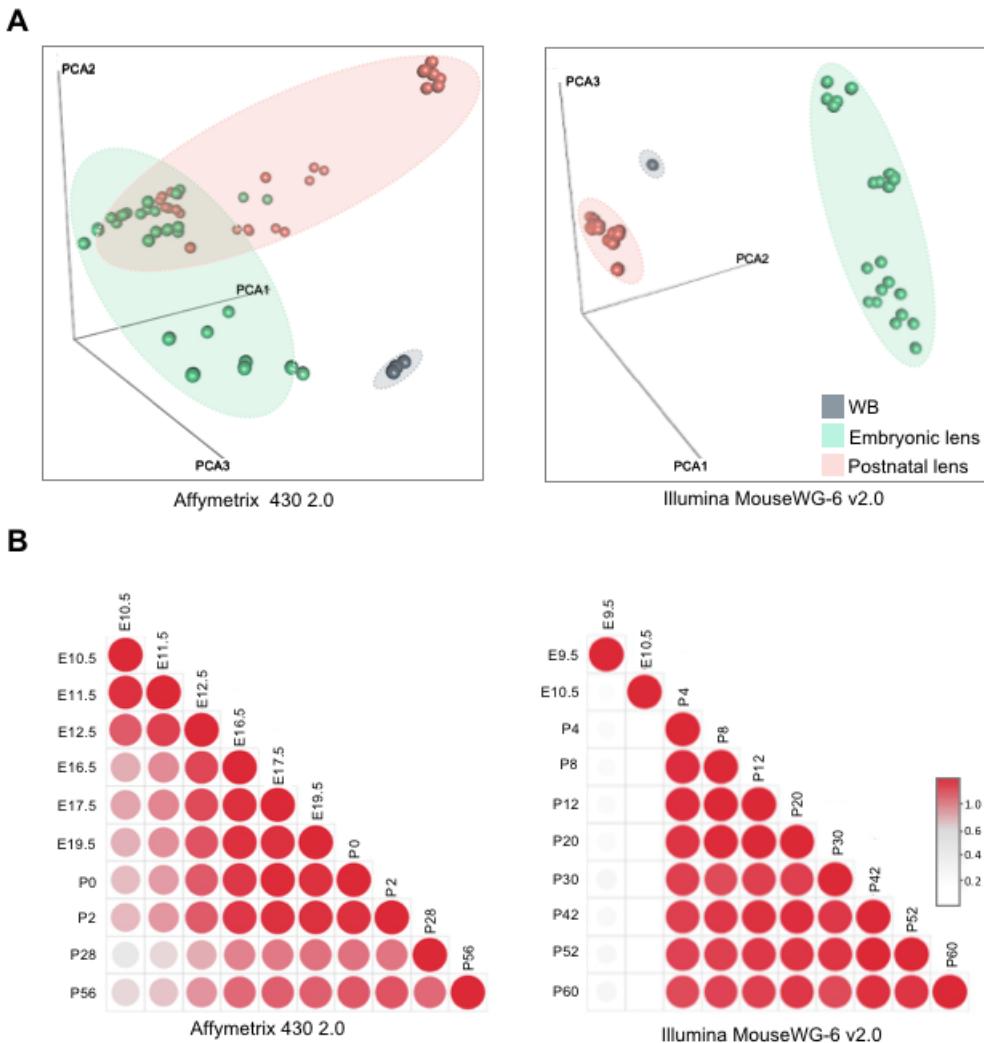
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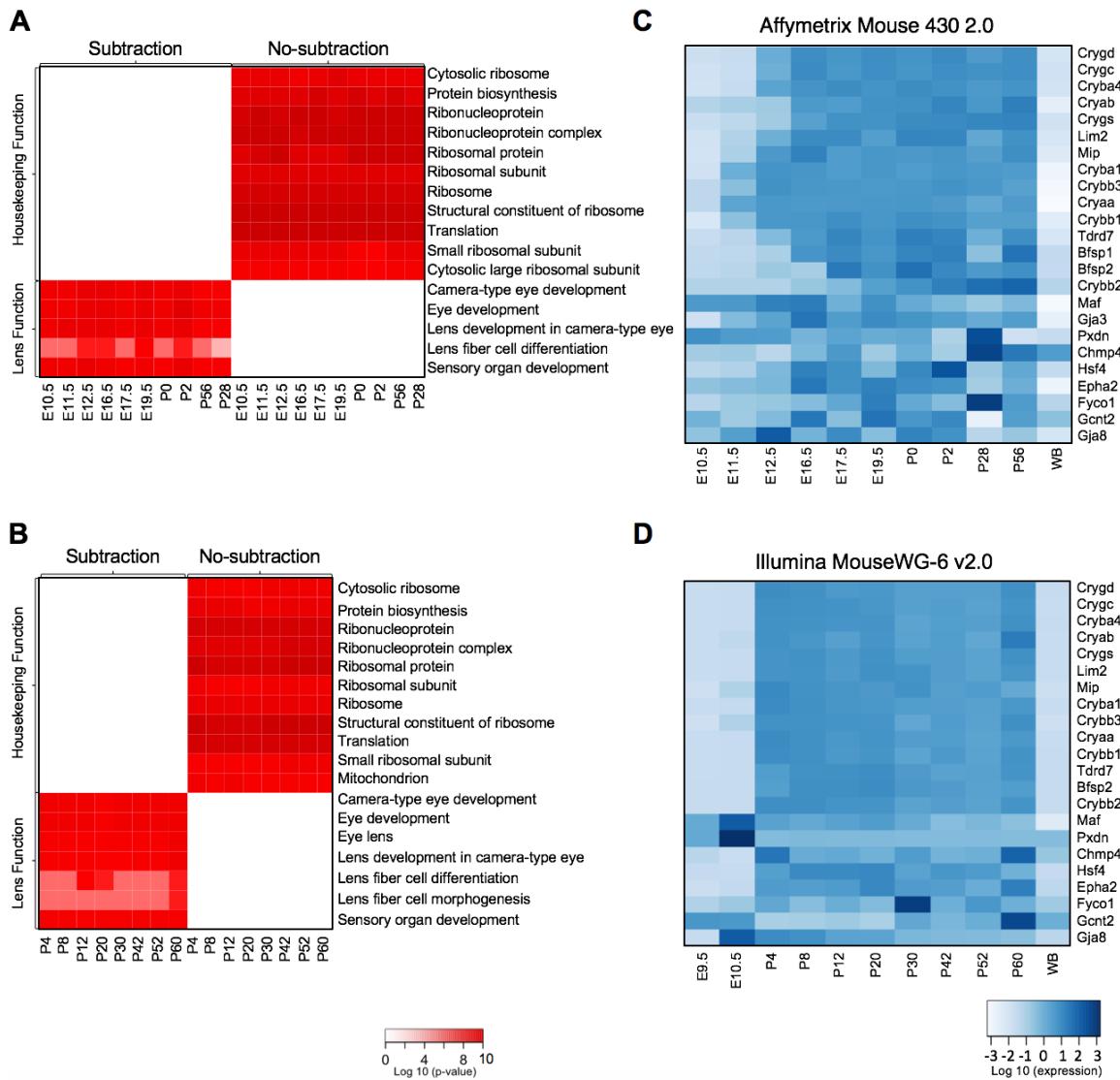
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**SUPPLEMENTARY FIGURE S1.**

**SUPPLEMENTARY FIGURE 1. Quality analysis of lens microarray datasets at embryonic, postnatal and adult stages.** (A) Principle component analysis (PCA) of normalized data from Affymetrix Mouse 430 2.0 and Illumina MouseWG-6 v2.0 microarray platforms along with platform-specific embryonic whole body (WB) control datasets. The plots showed a segregation of data in three main groups corresponding to embryonic (green), postnatal (pink) and WB control (grey). The colored ellipsoid indicates specific data group. (B) Correlation dot plot representing Pearson's correlation values for all-versus-all comparisons of the normalized, processed data. The color and size of dots indicate degree of consensus between datasets.

**SUPPLEMENTARY FIGURE S2.**

**SUPPLEMENTARY FIGURE 2. *In silico* WB-subtraction identifies lens tissue-enriched genes in embryonic, postnatal and adult lenses.** The top 500 highly ranked genes with and without WB subtraction from (A) Affymetrix Mouse 430 2.0 datasets for isolated whole lens tissue at stages E10.5, E11.5, E12.5, E16.5, E17.5, E19.5, P0, P2, P56, and from isolated lens epithelium at P28, and (B) Illumina MouseWG-6 v2.0 datasets from isolated whole lens tissue at stages P4, P8, P12, P20, P30, P42, P52, P60, were tested for gene ontology (GO) functional categories. The obtained statistically significant GO categories (Fisher's exact test and Bonferroni corrected  $p$ -value ( $p < 0.05$ )) with and without WB subtraction were visualized in the heat map. Heat map (red) intensity reflects statistically significant gene set enrichment. (C) Heat maps depicting expression of known genes linked to isolated (non-syndromic) human cataract cases in Affymetrix Mouse 430 2.0 lens datasets from stages E10.5, E11.5, E12.5, E16.5, E17.5, E19.5, P0, P2, P28 and P56 against the WB dataset and, (D) in the Illumina MouseWG-6 v2.0 lens datasets from stages E9.5, E10.5, P4, P8, P12, P20, P30, P42, P52, P60 against the WB dataset. Heat map (blue) intensity represents high to low gene expression.

**SUPPLEMENTARY FIGURE S3.****A**

Symbol	Rank	Dev E10.5 affy430	Dev E11.5 affy430	Dev E12.5 affy430	Dev E16.5 affy430	Dev E17.5 affy430	Dev E19.5 affy430	Dev P0 affy430	Dev P2 affy430	Dev P56 affy430
Cryaa	-	6096.34	22231.29	26968.79	26084.9	26887.72	27032.72	27180.48	25970.2	25995.96
Cryab	-	4051.36	5326.39	6239.69	18040.61	16928.76	19925.06	20418.22	23520.56	25273.56
Cryba1	-	2454.95	18264.48	28381.95	27502.56	24954.36	27102.99	24817.04	27257.21	25392.33
Cryba4	-	35.72	639.56	15661.34	21856.6	24935.58	21977.31	24851.24	23108.17	22000.5
Crybb1	-	428.27	10518.47	25522.76	25844.13	28954.47	25627.46	29168.25	27191.04	22185.05
Crybb2	-	89.41	108.12	115.05	1270.79	2672.05	8290.19	11947.88	17744.73	27794.09
Crybb3	-	5597.31	13149.38	27963.55	26321.33	26031	25269.45	25920.99	27533.09	22585.4
Crygb	-	25.32	208.27	10667.41	24642	19873.19	23485.56	20608.36	23628.24	23446.76
Crygd	-	273.12	554.12	13411.12	26053	22602.36	26042.58	23339.43	27073.42	25517.17
Crygs	-	228.36	885.45	3138.64	13952.11	19483.63	19210.45	21787.82	22036.03	24560.78

**B**

Symbol	Rank	Dev E10.5 affy430	Dev E11.5 affy430	Dev E12.5 affy430	Dev E16.5 affy430	Dev E17.5 affy430	Dev E19.5 affy430	Dev P0 affy430	Dev P2 affy430	Dev P56 affy430
Cryaa	-	300.04	693.14	909.54	877.95	897.02	902.01	907.03	869.48	867.07
Cryab	-	31.34	39.92	45.57	124.59	120.51	139.2	141.93	162.92	176.56
Cryba1	-	192.27	648.07	1092.94	1070.45	979.57	1060.85	967.42	1070.45	993.93
Cryba4	-	10.68	38.56	778.2	1068.97	1235.6	1082.39	1234.75	1139.35	1083.89
Crybb1	-	24.29	180.27	437.76	447.27	496.97	446.65	509.88	470.81	386.68
Crybb2	-	2.26	2.56	2.6	32.36	59.3	192.67	289.82	413	651.22
Crybb3	-	106.45	194.42	375.33	372.48	364.81	354.1	363.8	391.54	316.49
Crygb	-	11.55	13.37	749.61	1691.4	1392.06	1645.15	1456.21	1661.19	1644.01
Crygd	-	61.78	46.98	871.89	1682.04	1444.15	1673.9	1514.89	1752.26	1640.59
Crygs	-	35.33	47.11	198.91	907.66	1195.17	1193.51	1355.87	1366.25	1525.43

**SUPPLEMENTARY FIGURE 3. Lens expression and enriched expression of cyrystallin genes in iSyTE 2.0.** (A) Expression and (B) enrichment of ten crystallin-encoding genes in nine stages of lens (E10.5, E11.5, E12.5, E16.5, E17.5, E19.5, P0, P2, P56) as indicated by the processed Affymetrix microarray datasets on the iSyTE 2.0 web-interface.





**SUPPLEMENTARY FIGURE S6.**

**iSyTE** Integrated Systems Tool  
for Eye gene discovery

Home About Gene Expression Contacts

Lens Gene Expression

Standard Co-expression **Lens-enrichment in UCSC Browser**

Query gene: Cryga **Select species:**  Mouse mm10  Human hg19

Limit by: **1. Input query gene**  
 Threshold (Pearson Correlation > 0.75 or < -0.75)  N most correlated genes  
 0.9 10

**2. Select parameters and submit**  
 Submit

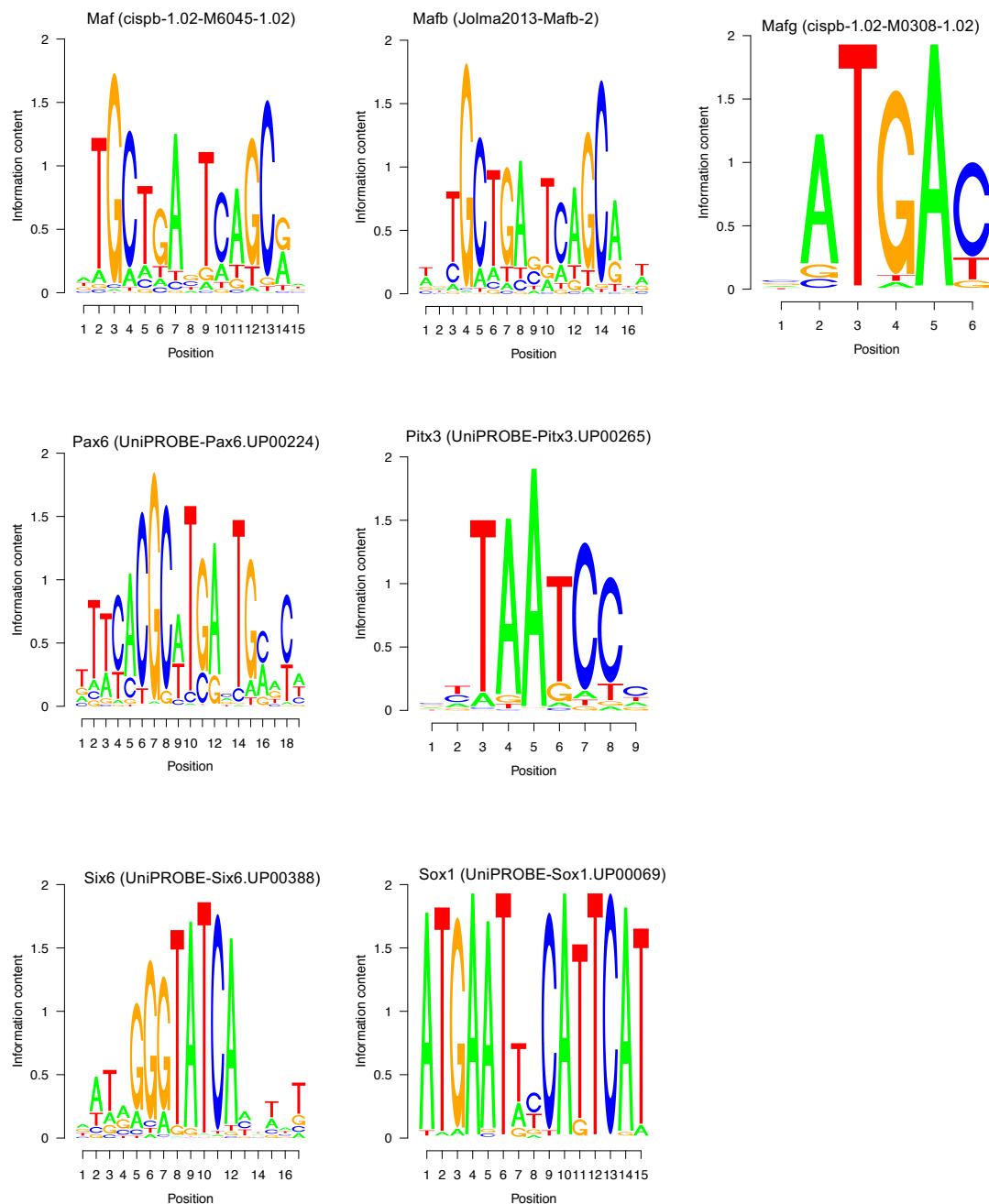
**3. View genes co-expressed with query** **Filter records:**

Query	Target	Correlation score
Cryga	Crygn	0.996958
Cryga	Lim2	0.994457
Cryga	Spg7	0.994243
Cryga	Crygb	0.994211
Cryga	Crybb1	0.994203
Cryga	Tmem126a	0.993859
Cryga	Cryba4	0.993747
Cryga	Grina	0.993683
Cryga	Ogn	0.992951
Cryga	Mip	0.99227

Showing 1 to 10 of 10 entries

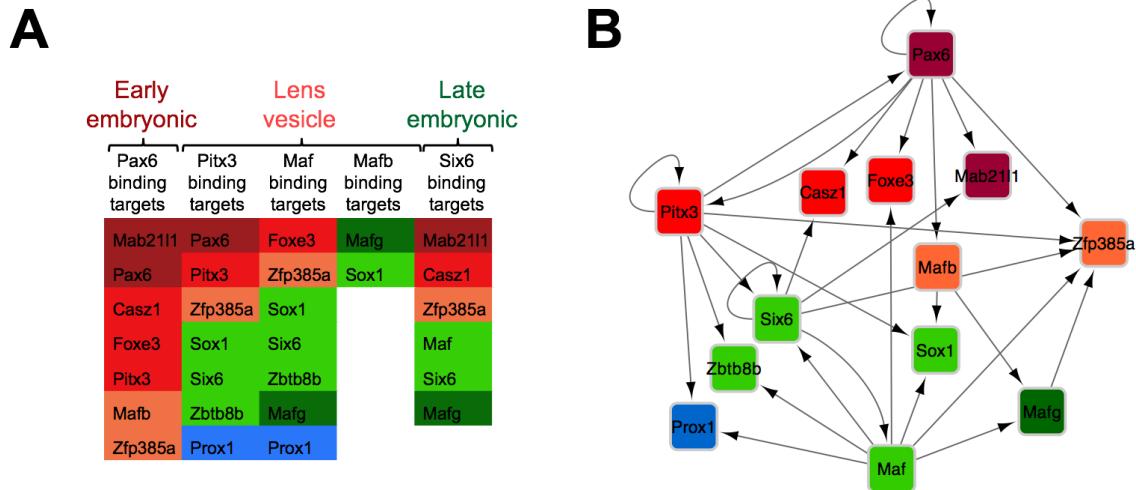
**SUPPLEMENTARY FIGURE 6. iSyTE 2.0 has a new feature to determine co-expressed genes.** Candidate genes that exhibit co-expression with a query gene can be searched using the Co-expression feature. This can be achieved by entering the candidate gene under the “query gene” (*Cryga* in the example above), and selecting the threshold for Pearson Correlation and the top number of correlated genes to be visualized as shown in steps 1-3.

## SUPPLEMENTARY FIGURE S7.



**SUPPLEMENTARY FIGURE 7. Transcription factor-Motifs used in expression-based gene regulatory network analysis.** Transcription factor binding motifs for Maf, Mafb, Mafg, Pax6, Pitx3, Six6 and Sox1 were obtained from MotifDB and used to search the -2500bp upstream of the transcription start site in the 528 genes from the clusters identified by SOTA.

## SUPPLEMENTARY FIGURE S8.



**SUPPLEMENTARY FIGURE 8. Transcription factor regulatory network predicted using iSyTE 2.0.** Regulatory connections between the transcription factors in the SOTA clusters were investigated for new insights into the temporal dynamics of their expression and that of their targets in the lens. **(A)** Transcription factor binding motif analysis for the proteins Pax6, Pitx3, Maf, Mafb and Six6 identifies putative binding sites in the -2500bp region upstream of the transcription start site within other transcription factor-encoding genes present in six clusters. Notably, we find Pax6 binding sites upstream of majority of the transcription factor genes that exhibit peak expression early in lens development. Indeed, six of nineteen potential transcription factor targets of Pax6 are in the early lens development, lens vesicle or primary fiber differentiation clusters. Conversely, the lens vesicle cluster transcription factors Pitx3, Maf, and Mafb as well as the late embryonic cluster transcription factors Six6 have binding sites upstream of other transcription factor genes, majority of which exhibit peak expression in lens vesicle stage and beyond. **(B)** Network representation of transcription factors based on the presence of their binding motif in other transcription factors expressed in the lens. This analysis suggests their temporal hierarchy in the lens.

**Supplementary Table S1. Mouse lens microarray datasets used in iSyTE 2.0.**

Dataset	Mouse Stage	GEO accession	Tissue	Genotype	Microarray platform	Reference
Development	E9.5	GSE49227	Lens placode	Wild-type	Illumina WG-6 v1.1	(1)
Development	E9.5	GSE49223	Lens placode	Wild-type	Illumina WG-6 v2.0	(2)
Development	E9.5	GSE49229	Lens placode	Wild-type	Illumina WG-6 v2.0	(1)
Development	E10.25	GSE49216	Lens pit	Wild-type	Illumina WG-6 v1.1	(1)
Development	E10.5	GSE49218	Lens pit	Wild-type	Illumina WG-6 v2.0	(2)
Development	E10.5	GSE32334	Lens pit	Wild-type	Affymetrix 430 2.0	(3)
Development	E11.5	GSE32334	Lens vesicle	Wild-type	Affymetrix 430 2.0	(3)
Development	E12.5	GSE32334	Lens	Wild-type	Affymetrix 430 2.0	(3)
Development	E15.5	GSE22322	Lens	Wild-type	Affymetrix 430A 2.0	(4)
Development	E16.5	GSE47694	Lens	Wild-type	Affymetrix 430 2.0	(5)
Development	E17.5	GSE16533	Lens	<i>E2f2</i> -/- (no lens phenotype)	Affymetrix 430 2.0	(6)

Development	E19.5	GSE31643	Lens	<i>Notch2</i> <sup>loxP;loxP</sup>	Affymetrix 430 2.0	(7)
Development	P0	GSE22362	Lens	Wild-type	Affymetrix 430A 2.0	(4)
Development	P0	GSE16533	Lens	<i>E2f2</i> <sup>-/-</sup> (no lens phenotype)	Affymetrix 430 2.0	(6)
Development	P2	GSE9711	Lens	Wild-type	Affymetrix 430 2.0	(8)
Development	P4	GSE25775	Lens	<i>Tdrd7</i> <sup>+/-</sup>	Illumina WG-6 v2.0	(9)
Development	P8	GSE100136	Lens	Wild-type	Illumina WG-6 v2.0	This study
Development	P12	GSE100136	Lens	Wild-type	Illumina WG-6 v2.0	This study
Development	P20	GSE100136	Lens	Wild-type	Illumina WG-6 v2.0	This study
Development	P28	GSE13402	Lens epithelium	Wild-type	Affymetrix 430 2.0	(10)
Development	P30	GSE25776	Lens	<i>Tdrd7</i> <sup>+/-</sup>	Illumina WG-6 v2.0	(9)
Development	P42	GSE100136	Lens	Wild-type	Illumina WG-6 v2.0	This study
Development	P52	GSE100136	Lens	Wild-type	Illumina WG-6 v2.0	This study
Development	P56	GSE47694	Lens	Wild-type	Affymetrix 430 2.0	(5)

Development	P60	GSE65500	Lens	<i>Mafg+/-;Mafk+/-</i>	Illumina WG-6 v2.0	(11)
Mutant	E9.5	GSE49227	Lens placode	<i>Le-Cre:Pax6<sup>loxP:loxP</sup></i>	Illumina WG-6 v1.1	(1)
Mutant	E9.5	GSE49223	Lens placode	<i>Le-Cre:Cbp<sup>loxP/loxP</sup>;p300<sup>loxP/loxP</sup></i>	Illumina WG-6 v2.0	(2)
Mutant	E9.5	GSE49229	Lens placode	<i>Le-Cre:Pax6<sup>loxP:loxP</sup></i>	Illumina WG-6 v2.0	(1)
Mutant	E10.25	GSE49216	Lens pit	<i>Le-Cre:Pax6<sup>loxP:loxP</sup></i>	Illumina WG-6 v1.1	(1)
Mutant	E10.5	GSE49218	Lens pit	<i>Le-Cre:Cbp<sup>loxP/loxP</sup>;p300<sup>loxP/loxP</sup></i>	Illumina WG-6 v2.0	(2)
Mutant	E15.5	GSE22322	Lens	<i>Brg1</i> dominant -ve	Affymetrix 430A 2.0	(4)
Mutant	E16.5	GSE47694	Lens	<i>Le-Cre:Klf4<sup>loxP:loxP</sup></i>	Affymetrix 430 2.0	(5)
Mutant	E17.5	GSE16533	Lens	<i>Cry-Cre:E2f1-/-;E2F2-/-;E2F3-/-</i>	Affymetrix 430 2.0	(6)
Mutant	E19.5	GSE31643	Lens	<i>Le-Cre:Notch2<sup>loxP:loxP</sup></i>	Affymetrix 430 2.0	(7)
Mutant	P0	GSE22362	Lens	<i>Hsf4-/-</i>	Affymetrix 430A 2.0	(4)
Mutant	P0	GSE16533	Lens	<i>Cry-Cre:E2f1-/-;E2F2-/-;E2F3-/-</i>	Affymetrix 430 2.0	(6)
Mutant	P2	GSE9711	Lens	<i>Cryaa-Foxe3</i> overexpress.	Affymetrix 430 2.0	(8)

Mutant	P4	GSE25775	Lens	<i>Tdrd7</i> -/-	Illumina WG-6 v2.0	(9)
Mutant	P28	GSE13402	Lens epithelium	<i>Sparc</i> -/-	Affymetrix 430 2.0	(10)
Mutant	P30	GSE25776	Lens	<i>Tdrd7</i> -/-	Illumina WG-6 v2.0	(9)
Mutant	P56	GSE47694	Lens	<i>Le-Cre:Klf4</i> <sup>loxP;loxP</sup>	Affymetrix 430 2.0	(5)
Mutant	P60	GSE65500	Lens	<i>Mafg</i> -/-: <i>Mafk</i> +/-	Illumina WG-6 v2.0	(11)

## REFERENCES

1. Huang,J., Rajagopal,R., Liu,Y., Dattilo,L.K., Shaham,O., Ashery-Padan,R. and Beebe,D.C. (2011) The mechanism of lens placode formation: a case of matrix-mediated morphogenesis. *Dev. Biol.*, **355**, 32–42.
2. Wolf,L., Harrison,W., Huang,J., Xie,Q., Xiao,N., Sun,J., Kong,L., Lachke,S.A., Kuracha,M.R., Govindarajan,V., *et al.* (2013) Histone posttranslational modifications and cell fate determination: lens induction requires the lysine acetyltransferases CBP and p300. *Nucleic Acids Res.*, **41**, 10199–10214.
3. Lachke,S.A., Ho,J.W.K., Kryukov,G.V., O'Connell,D.J., Aboukhalil,A., Bulyk,M.L., Park,P.J. and Maas,R.L. (2012) iSyTE: integrated Systems Tool for Eye gene discovery. *Invest. Ophthalmol. Vis. Sci.*, **53**, 1617–1627.
4. He,S., Pirty,M.K., Wang,W.-L., Wolf,L., Chauhan,B.K., Cveklova,K., Tamm,E.R., Ashery-Padan,R., Metzger,D., Nakai,A., *et al.* (2010) Chromatin remodeling enzyme Brg1 is required for mouse lens fiber cell terminal differentiation and its denucleation. *Epigenetics Chromatin*, **3**, 21.
5. Gupta,D., Harvey,S.A.K., Kenchegowda,D., Swamynathan,S. and Swamynathan,S.K. (2013) Regulation of mouse lens maturation and gene expression by Krüppel-like factor 4. *Exp. Eye Res.*, **116**, 205–218.
6. Wenzel,P.L., Chong,J.-L., Sáenz-Robles,M.T., Ferrey,A., Hagan,J.P., Gomez,Y.M., Rajmohan,R., Sharma,N., Chen,H.-Z., Pipas,J.M., *et al.* (2011) Cell proliferation in the absence of E2F1-3. *Dev. Biol.*, **351**, 35–45.
7. Saravanamuthu,S.S., Le,T.T., Gao,C.Y., Cojocaru,R.I., Pandiyan,P., Liu,C., Zhang,J., Zelenka,P.S. and Brown,N.L. (2012) Conditional ablation of the Notch2 receptor in the ocular lens. *Dev. Biol.*, **362**, 219–229.
8. Landgren,H., Blixt,A. and Carlsson,P. (2008) Persistent FoxE3 expression blocks cytoskeletal remodeling and organelle degradation during lens fiber differentiation. *Invest. Ophthalmol. Vis. Sci.*, **49**, 4269–4277.
9. Lachke,S.A., Alkuraya,F.S., Kneeland,S.C., Ohn,T., Aboukhalil,A., Howell,G.R., Saadi,I., Cavallesco,R., Yue,Y., Tsai,A.C.-H., *et al.* (2011) Mutations in the RNA granule component TDRD7 cause cataract and glaucoma. *Science*, **331**, 1571–1576.
10. Greiling,T.M.S., Stone,B. and Clark,J.I. (2009) Absence of SPARC leads to impaired lens circulation. *Exp. Eye Res.*, **89**, 416–425.
11. Agrawal,S.A., Anand,D., Siddam,A.D., Kakrana,A., Dash,S., Scheiblin,D.A., Dang,C.A., Terrell,A.M., Waters,S.M., Singh,A., *et al.* (2015) Compound mouse mutants of bZIP transcription factors Mafg and Mafk reveal a regulatory network of non-crystallin genes associated with cataract. *Hum. Genet.*, **134**, 717–735.

**Supplementary Table S2. Expression-based clustering analysis of Affymetrix genes**

Gene Symbol	res.c lust	Expressio n_E10.5	Expressio n_E11.5	Expressio n_E12.5	Expressio n_E16.5	Expressio n_E17.5	Expressio n_E19.5	Expressi on_P0	Expressi on_P2	Expressi on_P56	Enrichmen t_E10.5	Enrichmen t_E11.5	Enrichmen t_E12.5	Enrichmen t_E16.5	Enrichmen t_E17.5	Enrichmen t_E19.5	Enrichm ent_P0	Enrichm ent_P2	Enrichme nt_P56
Nuprl	1	1956.9	2464.7	3493.2	6979.6	7155.8	7761.3	7356.5	6505.3	10098.6	74.0	97.9	124.8	253.0	279.2	298.8	286.0	232.5	388.8
Grifin	1	158.9	788.4	2567.1	5023.6	5977.6	6204.7	7366.0	9442.2	17842.4	3.8	12.7	40.1	85.4	96.3	100.4	118.9	152.0	288.4
Sox2ot	1	229.3	351.7	481.3	202.5	503.2	719.7	651.7	656.5	1123.4	23.9	32.1	41.1	26.5	46.0	66.2	60.2	60.8	103.3
Cela1	1	386.5	518.5	1484.5	2347.4	2409.9	860.4	2491.5	1922.2	3120.6	11.5	15.7	42.6	65.7	70.0	24.9	72.2	54.9	90.4
Crybb2	1	89.4	108.1	115.0	1270.8	2672.0	8290.2	11947.9	17744.7	27794.1	2.3	2.6	2.6	32.4	59.3	192.7	289.8	413.0	651.2
Smco3	1	26.6	45.9	84.8	1048.3	1452.1	1225.2	1605.1	1784.5	2395.3	2.2	3.5	6.8	89.4	122.9	101.7	134.1	153.6	199.5
Clu	1	2023.0	2827.6	4907.8	7319.4	4053.7	4863.9	7096.4	8225.6	17433.7	8.9	10.4	21.7	33.2	18.0	21.9	28.7	37.7	78.6
Mboat1	1	138.7	329.4	1030.6	2089.8	2417.4	2238.7	2862.9	2709.0	5531.9	3.6	5.6	19.7	42.3	49.5	45.3	57.7	52.9	111.9
Gpr160	1	34.1	84.1	400.4	942.2	1543.7	829.2	1625.7	836.4	2788.7	2.0	3.3	19.1	43.5	72.4	39.2	75.2	40.5	131.4
Anxa1	1	2615.1	1784.2	1347.0	2686.0	2702.6	2096.5	2835.4	3050.6	7572.4	17.6	11.5	9.2	18.5	17.2	14.4	19.3	21.8	52.0
E130218I_03Rik	1	185.3	167.5	155.3	201.0	205.2	180.9	217.3	75.3	1511.3	12.9	8.5	10.0	13.7	14.0	12.3	14.1	6.6	102.5
Ass1	1	1522.1	1646.5	822.5	1270.4	841.5	586.5	1183.9	2614.9	3086.2	23.4	26.0	12.4	17.8	11.5	7.9	15.9	36.3	43.3
Folrl	1	410.6	276.1	235.6	616.7	505.5	974.1	686.4	1358.3	2336.7	9.6	6.7	5.8	14.6	11.5	23.5	16.4	33.9	56.5
Cyp4v3	1	246.2	214.7	210.0	412.2	441.5	337.3	484.7	327.5	845.0	8.4	6.3	7.0	15.1	15.4	11.6	16.1	11.4	29.2
S100a4	1	75.6	43.7	90.3	1202.9	2560.1	2850.4	3802.8	3009.8	5760.6	1.7	1.0	2.8	31.1	67.5	74.4	99.6	79.7	149.3
Dnase2b	1	16.0	13.0	12.6	1260.5	1246.8	779.5	1752.7	1663.6	4441.2	1.4	-1.1	1.0	94.5	92.9	56.8	125.7	107.2	324.7
Metnl	1	209.8	288.9	470.5	1057.8	1342.1	1108.4	1640.5	1117.2	4682.4	2.8	3.9	6.4	14.0	17.8	14.6	21.7	15.8	61.8
Dap11	1	64.7	82.4	69.2	371.8	545.5	1696.4	465.5	1715.1	8734.5	1.8	2.0	1.9	10.5	15.9	47.9	11.7	54.4	246.1
Aldoc	1	215.5	249.9	314.3	1847.3	2162.9	4608.2	3928.1	5431.1	11351.0	1.6	1.8	2.3	13.0	15.3	32.8	28.0	40.2	81.0
Dtna	1	136.4	142.8	159.5	378.0	333.1	517.3	420.4	621.2	1673.8	4.4	4.1	5.0	11.7	11.4	16.7	13.7	20.0	54.1
Gpr137b-ps	1	634.2	895.2	1771.3	2153.7	1876.4	1949.5	2095.8	2044.7	3703.3	3.1	4.4	9.9	12.7	10.9	11.2	12.0	11.8	21.3

Necab1	1	70.3	32.3	32.1	82.7	96.6	87.9	123.8	83.6	348.0	6.2	3.4	3.0	7.7	8.7	8.2	11.5	7.9	32.5	
Ngef	1	59.2	96.9	186.6	476.5	605.8	604.6	845.0	648.0	1400.5	1.5	2.5	4.9	12.5	16.5	16.6	23.0	17.4	38.6	
Kenj12	1	137.2	242.6	279.6	197.2	247.9	202.9	260.1	140.4	287.8	5.0	7.9	10.3	8.1	9.6	7.9	9.7	5.9	11.2	
Myo6	1	196.3	301.2	296.4	308.1	322.9	329.5	363.4	214.1	532.1	4.7	5.6	7.0	7.0	7.0	7.6	7.7	4.9	12.3	
2310030G06Rik	1	153.8	104.8	82.1	155.0	164.7	207.4	228.2	148.9	1313.7	4.9	2.9	3.0	5.6	5.1	7.4	8.3	5.3	46.7	
Dhx32	1	236.6	370.3	842.1	1705.9	2134.4	1994.1	2280.2	2267.8	5853.5	1.4	2.0	4.6	9.1	12.0	10.9	12.4	12.4	32.1	
Ablim1	1	593.3	526.4	605.1	715.4	626.2	785.6	619.0	634.5	1092.9	4.8	4.6	5.5	6.4	5.6	7.0	5.2	5.8	9.7	
P4ha1	1	959.7	946.0	956.9	1368.1	1524.9	2026.9	1008.3	842.8	2174.8	4.2	4.1	4.6	6.3	7.2	9.1	4.7	3.9	9.7	
Fam134b	1	336.3	287.0	289.0	619.6	487.0	540.5	537.8	250.6	925.7	4.2	2.7	3.3	7.9	6.1	6.9	6.6	3.6	11.8	
Ndrg1	1	34.0	26.4	127.5	2492.4	3020.5	4242.1	5322.6	3650.8	10181.6	-2.6	-4.3	1.0	20.6	23.7	34.3	44.0	29.4	87.4	
Gstm1	1	251.0	455.3	665.7	1424.3	1698.7	1707.3	1884.1	2117.8	3579.5	1.3	2.3	3.3	7.2	7.9	8.5	9.1	10.5	17.7	
Col4a4	1	14.4	17.2	16.9	96.7	263.4	590.3	847.9	726.0	1925.8	-1.2	-1.2	-1.0	5.8	12.7	30.3	42.7	38.0	100.6	
Dct	1	65.0	148.6	84.3	89.4	293.4	604.7	169.0	549.6	973.7	1.6	3.9	2.2	2.2	6.7	14.6	4.2	13.9	23.4	
Arsi	1	309.4	348.8	308.8	395.7	626.7	223.6	597.0	77.1	649.4	4.6	4.6	4.3	5.4	8.5	3.3	8.4	1.1	9.5	
Lgals3	1	19.1	42.8	31.9	424.2	302.3	445.7	450.3	767.5	4834.2	-1.3	1.2	1.4	13.9	9.6	13.9	14.1	23.1	151.2	
Fam169a	1	335.9	428.6	498.7	394.5	383.0	502.3	384.8	302.2	565.2	4.0	4.6	5.9	5.0	4.9	6.1	4.7	3.7	6.9	
Birc7	1	45.8	38.1	50.3	477.1	675.2	826.3	963.4	762.4	2642.3	1.1	1.1	1.3	11.8	18.2	20.6	24.1	19.6	66.5	
Oca2	1	21.4	52.7	53.8	80.6	125.0	218.9	142.8	110.6	287.2	1.2	2.7	3.0	4.4	6.4	12.3	8.0	6.6	16.0	
Rippl1	1	311.6	448.2	984.1	1222.3	1424.6	1295.9	1525.8	869.5	1928.6	1.7	2.4	5.8	7.2	8.2	7.4	8.6	5.0	11.1	
Tpd52	1	1262.8	896.3	1007.2	1308.0	1555.4	1325.8	1652.7	1685.3	2318.0	4.7	3.0	3.6	4.7	5.7	4.8	6.0	6.1	8.4	
Emb	1	1033.8	706.5	452.1	641.8	898.7	700.5	1327.4	1151.0	2122.1	5.9	4.1	2.6	3.5	4.9	3.9	7.6	6.1	11.9	
Ephx2	1	131.7	72.2	74.5	181.3	184.9	201.8	217.1	123.6	409.9	3.8	2.1	2.4	5.7	5.9	6.6	7.0	4.1	13.3	
Ptgds	1	149.5	263.0	345.7	505.9	987.5	3117.0	1165.7	3226.7	9600.2	-1.2	1.6	2.2	3.0	5.9	19.3	7.8	20.4	59.9	
Prrt4	1	155.6	189.2	152.6	239.4	199.9	110.2	251.3	159.3	489.5	3.6	4.3	3.6	5.3	4.5	2.4	5.5	3.5	11.0	
Dnajb2	1	187.3	215.1	401.1	1386.0	1732.9	1182.3	2162.7	1332.5	2920.9	1.3	1.5	2.4	9.0	11.4	7.8	14.3	9.2	19.2	





































Gbf1	10	455.1	544.1	587.3	414.1	474.5	387.8	487.4	444.1	262.5	3.4	4.0	5.1	3.8	4.0	3.2	3.9	3.4	2.2
Fam43a	10	224.5	556.7	696.5	192.9	153.4	74.9	95.3	44.2	42.1	2.2	4.4	6.6	1.9	1.3	-1.5	-1.2	-2.1	-2.6
Sipa1l3	11	684.3	1156.8	1222.4	1193.2	821.1	746.5	856.1	645.6	609.7	5.8	9.3	10.3	10.0	6.5	6.1	6.9	5.2	5.0
Lacc1	11	301.2	374.7	463.0	406.7	339.8	143.8	348.6	65.6	361.6	8.0	8.1	11.2	9.9	8.2	3.5	8.2	1.7	8.7
Man1c1	11	777.0	786.7	836.9	991.4	708.4	725.8	794.1	582.6	588.6	6.3	6.7	6.8	7.9	5.7	5.8	6.1	4.8	4.7
Slc25a23	11	132.0	271.2	240.1	253.9	112.1	202.8	112.6	116.7	188.0	3.3	6.6	6.5	7.2	3.2	5.7	3.1	3.3	5.3
5830408B 19Rik	11	364.8	671.1	698.0	673.5	533.0	421.1	433.2	384.7	295.3	4.0	5.3	6.4	6.5	5.3	4.2	4.1	3.7	2.9
Dgkb	11	118.2	166.2	159.8	102.9	73.3	79.7	46.3	51.1	176.9	5.6	6.9	8.4	5.4	3.7	4.1	2.4	2.5	9.0
Espn	11	47.6	85.8	97.0	68.9	28.5	25.5	28.5	33.7	29.1	4.5	7.1	9.0	7.2	2.7	2.5	2.6	3.3	2.8
Septin8	11	1160.4	1779.4	2152.7	976.9	861.0	1008.4	825.4	672.4	1353.3	4.1	6.0	7.0	3.3	2.9	3.4	2.8	2.3	4.5
Msi1	11	1041.8	1583.6	1778.7	2286.5	668.2	1171.6	802.8	696.5	431.3	2.6	4.4	5.2	6.0	1.8	3.0	2.1	1.8	1.1
Rgs13	11	19.2	91.3	84.3	50.1	13.1	9.7	9.8	7.2	11.0	3.1	8.7	12.8	6.6	1.8	1.4	1.4	1.1	1.6
Spp1	11	54.0	144.5	178.6	113.4	7.8	8.3	10.5	13.3	19.0	2.5	7.4	8.0	5.0	-2.8	-2.6	-2.1	-1.6	-1.1
Cyb56l	11	151.6	251.1	177.3	93.4	39.5	28.2	31.8	18.9	29.6	3.2	4.2	4.0	1.9	-1.3	-1.7	-1.5	-2.5	-1.7