Supplementary Figure 1

C.


US-AS
Count



DS-AS






E.


Intergenic distance (bp)

embryonic camera-type eye morphogenesis GO:0048596 -

Supplementary Figure 3
A.

GM12878
K562
Hsmm
Liver
Kidney
Heart

## Cerebellum

Brain
Testis
ES (cyt)
ES (celli)
ES (nuc)
B.

Liver
Heart
Kidney
C2C12
C2C12+EqS
MEL dmso
MEL
ES
Brain Testis
E.



Supplementary Figure 4

cardiac ventricle formation GO:0003211 neuroepithelial cell dif erentiation GO:0060563 neural tube formation GO:0001841 learning or memory GO:0007611 striatum development GO:0021756 grooming behavior GO:0007625 negative regulation of cell death GO:0060548 eyelid development in camera-type eye GO:0061029. positive regulation of JAK-STAT cascade GO:0046427 spinal cord motor neuron dif erentiation GO:0021522. estrogen metabolic process GO:0008210 noradrenergic neuron dif erentiation GO:0003357 palate development GO:0060021 positive regulation of epithelial cell p... GO:0050679 negative regulation of cell migration GO:0030336 cellular response to f uid shear stress GO:0071498 limb bud formation GO:0060174 positive regulation of phosphatidylinosi... GO:0014068 response to amphetamine GO:0001975 positive regulation of neuron dif erenti... GO:0045666

Brain

response to estrogen GO:0043627 negative regulation of cyclin-dependent ... GO:0045736 negative regulation of cardiac muscle ce... GO:0010667 adult heart development GO:0007512 limb development GO:0060173 mRNA processing GO:0006397 skeletal muscle tissue development GO:0007519 negative regulation of canonical Wnt sig... GO:0090090 cellular response to hypoxia GO:0071456 gonad development GO:0008406 hair follicle development GO:0001942 angiogenesis GO:0001525
regulation of myotube dif erentiation GO:0010830 Wnt signaling pathway, planar cell polar... GO:0060071 male sex determination GO:0030238 Golgi organization GO:0007030 striated muscle contraction GO:0006941 organ formation GO:0048645 protein kinase B signaling GO:0043491 regulation of cell growth by extracellul... GO:0001560
regulation of gene expression by genetic... GO:0006349 chromatin modif cation GO:0016568 endocrine pancreas development GO:0031018 response to cytokine GO:0034097 cellular response to mechanical stimulus GO:0071260 signal transduction involved in regulati... GO:0023019 memory GO:0007613 platelet activation GO:0030168 transcription, DNA-templated GO:0006351 glucose homeostasis GO:0042593 lung epithelial cell dif erentiation GO:0060487 positive regulation of transcription fro... GO:0045944 regulation of catalytic activity GO:0050790 regulation of cell adhesion GO:0030155 response to UV GO:0009411 glucose import GO:0046323 T cell proliferation GO:0042098 protein kinase B signaling GO:0043491 protein phosphorylation GO:0006468 positive regulation of transcription fro... GO:0000432


Supplementary Figure 6
B.
A.





F.
G.
G.

| HOXA5 locus |  |  |
| :---: | :---: | :---: |
|  | 5kb |  |
| ноXA5 | Coding genes | HOXA7 |

G
NR2F1 locus




Supplementary Figure 7


## A.





## B.

$$
10 \mathrm{~kb} \longmapsto \mathrm{hg} 38
$$

chr12: 121,800,000।
121,820,000।
121,830,000।
Basic Gene Annotation Set from GENCODE Version 22 (Ensembl 79)


100 vertebrates Basewise Conservation by PhyloP





## C.



Basic Gene Annotation Set from GENCODE Version 22 (Ensembl 79)


100 vertebrates Basewise Conservation by PhyloP



Supplementary Figure 9
A.

H1-hESC

C.

HSMM

B.
(
D.

K562
ces

Supplementary Figure 10
A.

$C$

E.
endocrine system development GO:0035270
positive regulation of transcription fro... GO:0045944 positive regulation of transcription, DN... GO:0045893 positive regulation of gene expression GO:0010628 positive regulation of RNA biosynthetic ... GO:1902680 positive regulation of biosynthetic proc... GO:0009891 positive regulation of RNA metabolic pro... GO:0051254 positive regulation of macromolecule bio... GO:001055 positive regulation of nucleobase-contai... GO:0045935 positive regulation of cellular biosynth... GO:0031328 positive regulation of nitrogen compound... GO:0051173 regulation of transcription from RNA pol... GO:0006357 transcription from RNA polymerase II pro... GO:0006366 sitive regulation of macromolecule met... GO:0010604 positive regulation of metabolic process GO:0009893 positive regulation of cellular metaboli... GO:0031325 positive regulation of cellular process GO:0048522 positive regulation of biological proces... GO:0048518 multicellular organismal development GO:0007275

cell fate commitment GO:0045165 forebrain development GO:0030900 brain development GO:0007420 central nervous system development GO:0007417 organ morphogenesis GO:0009887 positive regulation of transcription, DN... GO:0045893 positive regulation of RNA biosynthetic ... GO:1902680 positive regulation of gene expression GO:0010628 posive regulation of macromolecule bio... GO:001055 positive regulation of biosynthetic proc... GO:0009891 nervous system development GO:0007399 anatomical structure morphogenesis GO:0009653 organ development GO:0048513 system development GO:0048731 multicellular organismal development GO:0007275 anatomical structure development GO:0048856 single-organism developmental process GO:0044767 developmental process GO:0032502 single-multicellular organism process GO:0044707 multicellular organismal process GO:0032501


B


F.



POU3F3-OLAP and BT



HOXB5-AS


FOXA2-DS-S


NR2F1-US-AS


HNFG-US-S

A.

C.

B.






D.




FOXA2 locus

B.

F.


G.

D.

E.

H.

A.


Supplementary Figure 17

B.

A.

B.


