Science

Compar

MAMMA

Traces of evolutionary history appear in functional morphology and DNA sequences of living and extinct species. These remnants of the past can lead to insights into the relationships among extant groups of animals, the forces driving evolution, and the utility of animal models for studying human disease. We present below one evolutionary interpretation for the still-disputed hierarchy of surviving placental mammalian orders (excluding monotremes and marsupials), which is a synthesis of accumulated molecular and morphological inferences. The time scale is derived largely from molecular data; indicated fossil remains are much younger, raising contr
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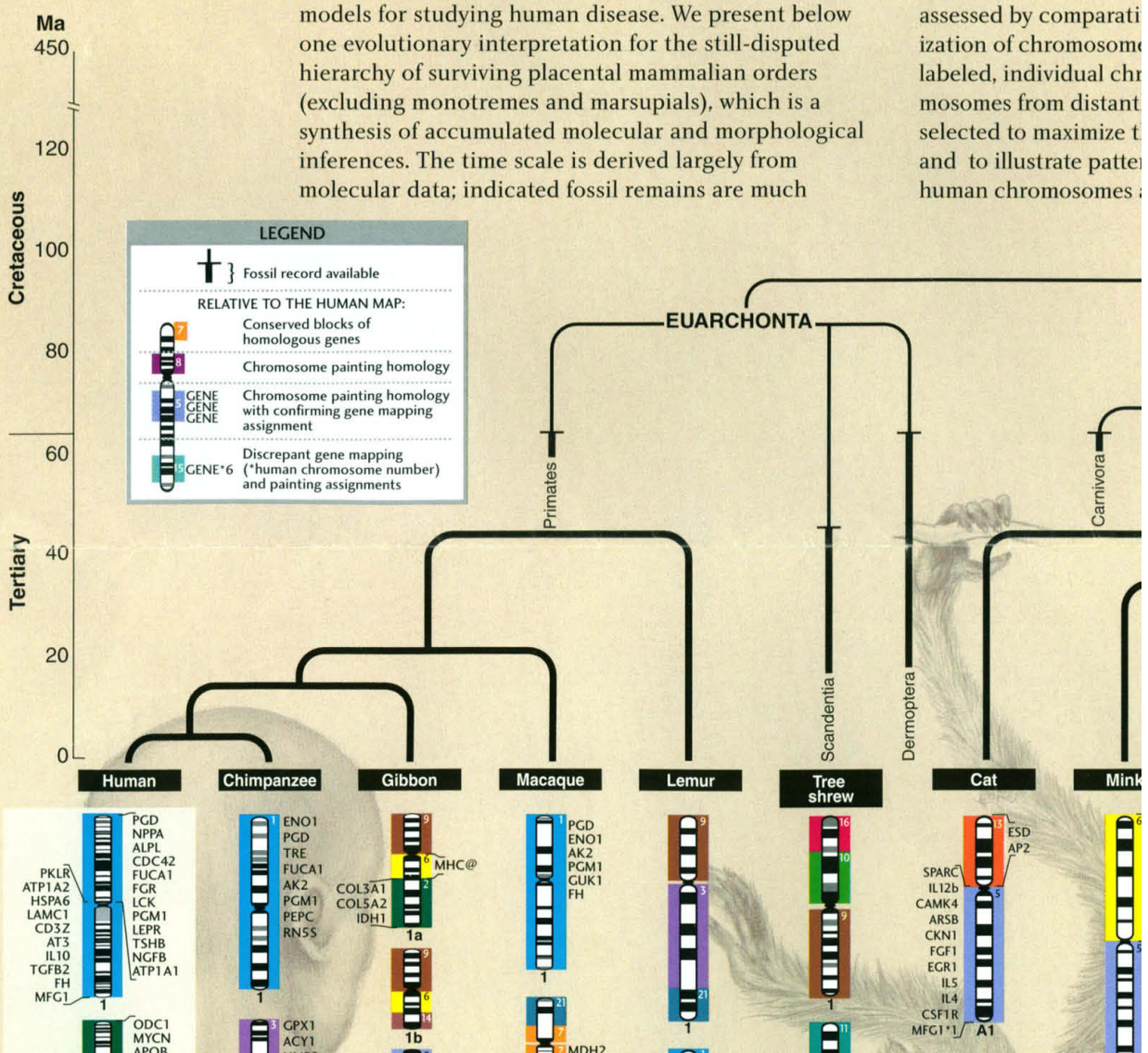

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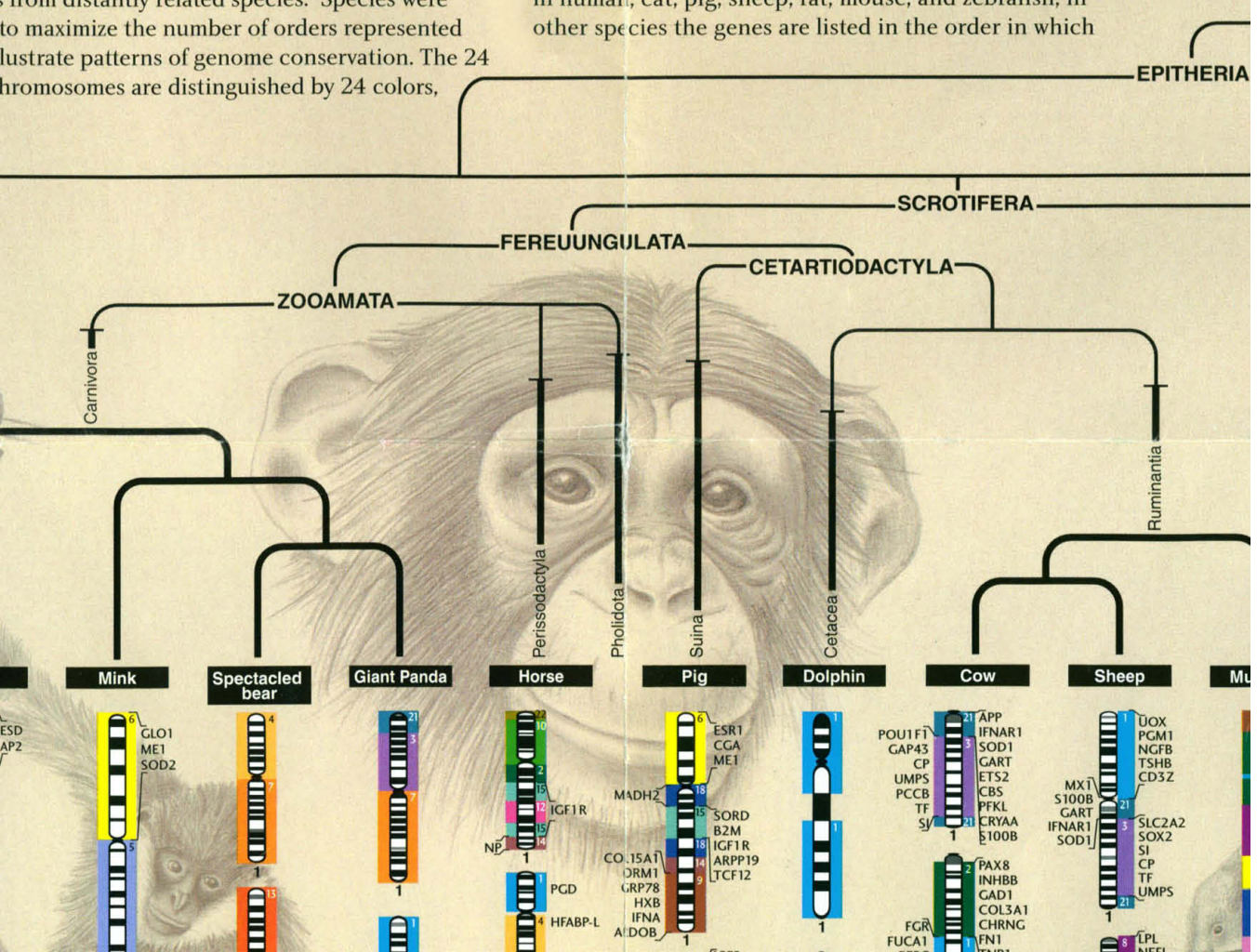
MALIAN RADIA

raising controversies around the precise age of ancestors. The tips of the phylogenetic tree enomes for 21 representative species from 11 hich are labeled on the vertical lines. These s show genome-wide homology alignments by comparative gene mapping or direct visual- f chromosome painting, in which fluorescently ndividual chromosomes are hybridized to chro- s from distantly related species. Species were to maximize the number of orders represented lustrate patterns of genome conservation. The 24 hromosomes are distinguished by 24 colors, and regions of human chromosome homology in other species are indicated by color and human chromosome number (for example, cat chromosome A1 contains gene stretches homologous to human chromosomes 5 and 13). Selected gene homologs in each species represent a subset of extensive comparative gene mapping data; thus genes listed may not reflect the extreme borders of the conserved segments. Gene orders have been determined in human, cat, pig, sheep, rat, mouse, and zebrafish; in other species the genes are listed in the order in which they appe linkage gr is present served for cussion o be found associate feature/d



enomics

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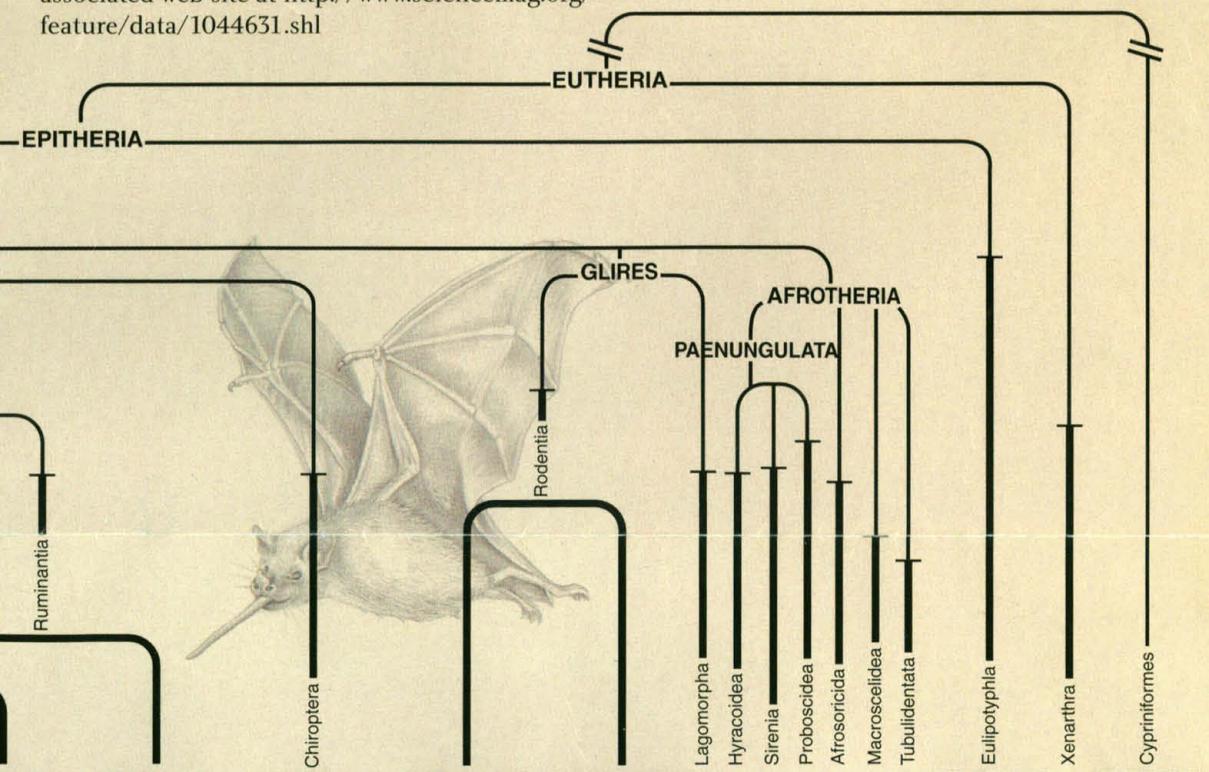
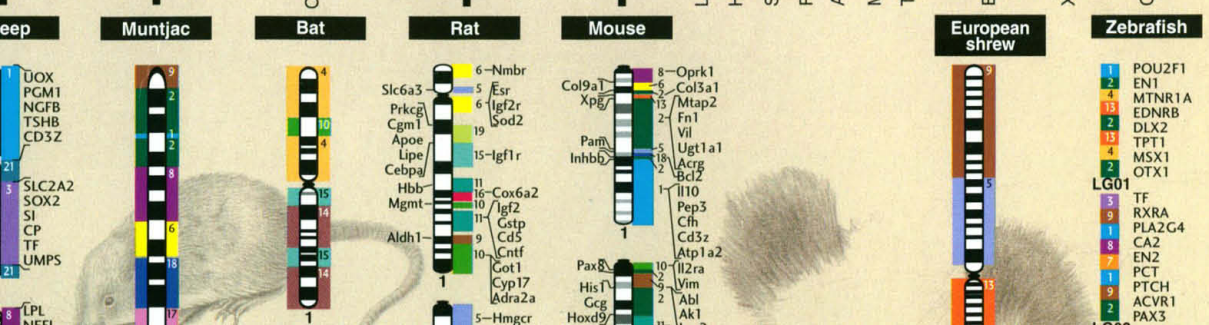
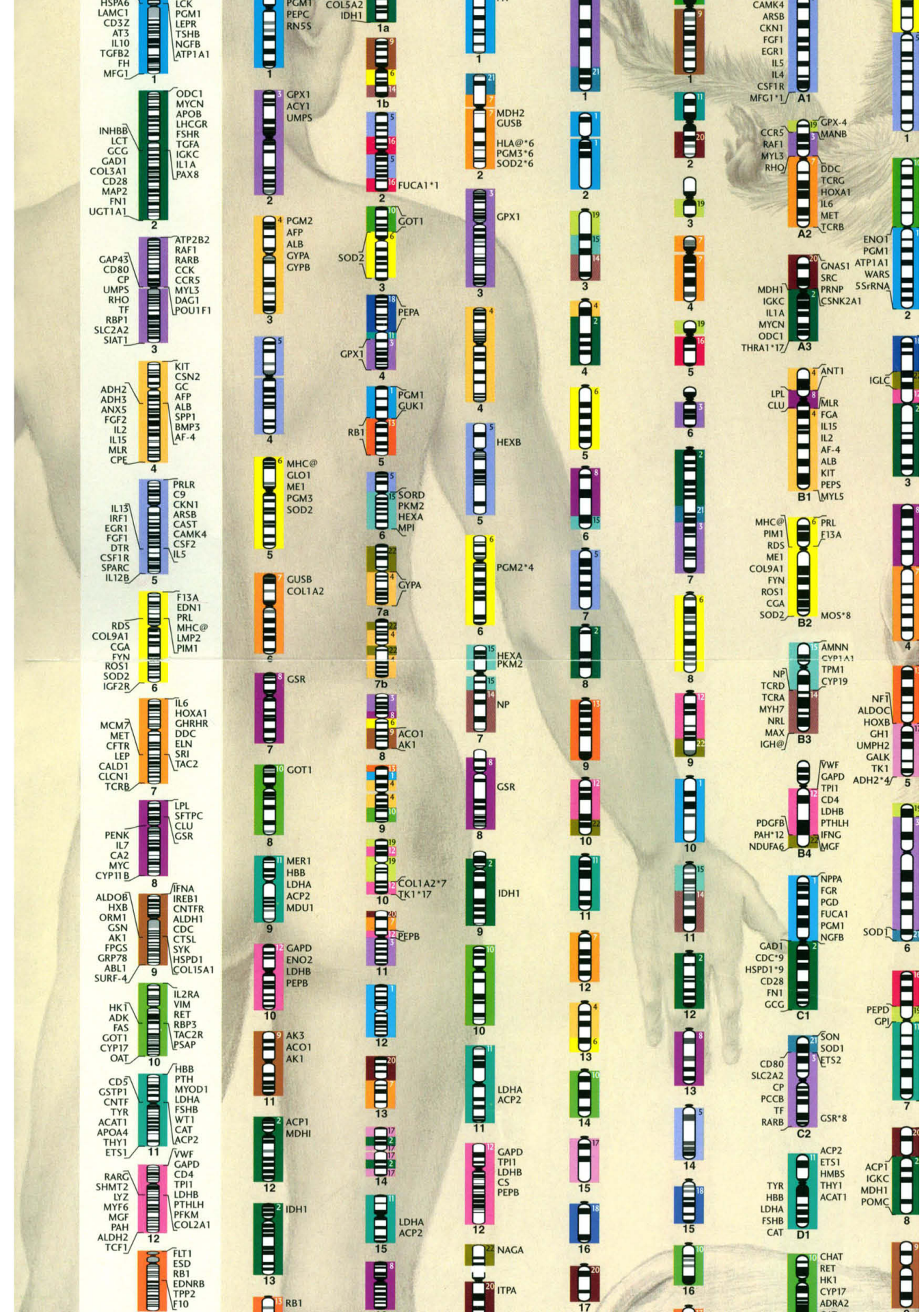
X Genome Maps Ten

they appear in humans. The zebrafish map, including 25 linkage groups not yet assigned to the 25 chromosomes, is presented to illustrate the array of gene segments conserved for 450 million years. Further information and discussion of dissenting views of mammalian evolution can be found in the 15 October 1999 issue of *Science* and the associated web site at http://www.sciencemag.org/feature/data/1044631.shl



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3
PGM2
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GYPA
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GOT1
SOD2
PEPA
GPX1
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ALB
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BMP3
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PGM1
GUK1
RB1
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MHC@
GLO1
ME1
PGM3
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HEXA
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IL13
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EGR1
FGF1
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CSF1R
SPARC
IL12B
PRLR
C9
CKN1
ARSB
CAST
CAMK4
CSF2
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5
GUSB
COL1A2
GYPA
7a
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ROS1
SOD2
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EDN1
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CYP19
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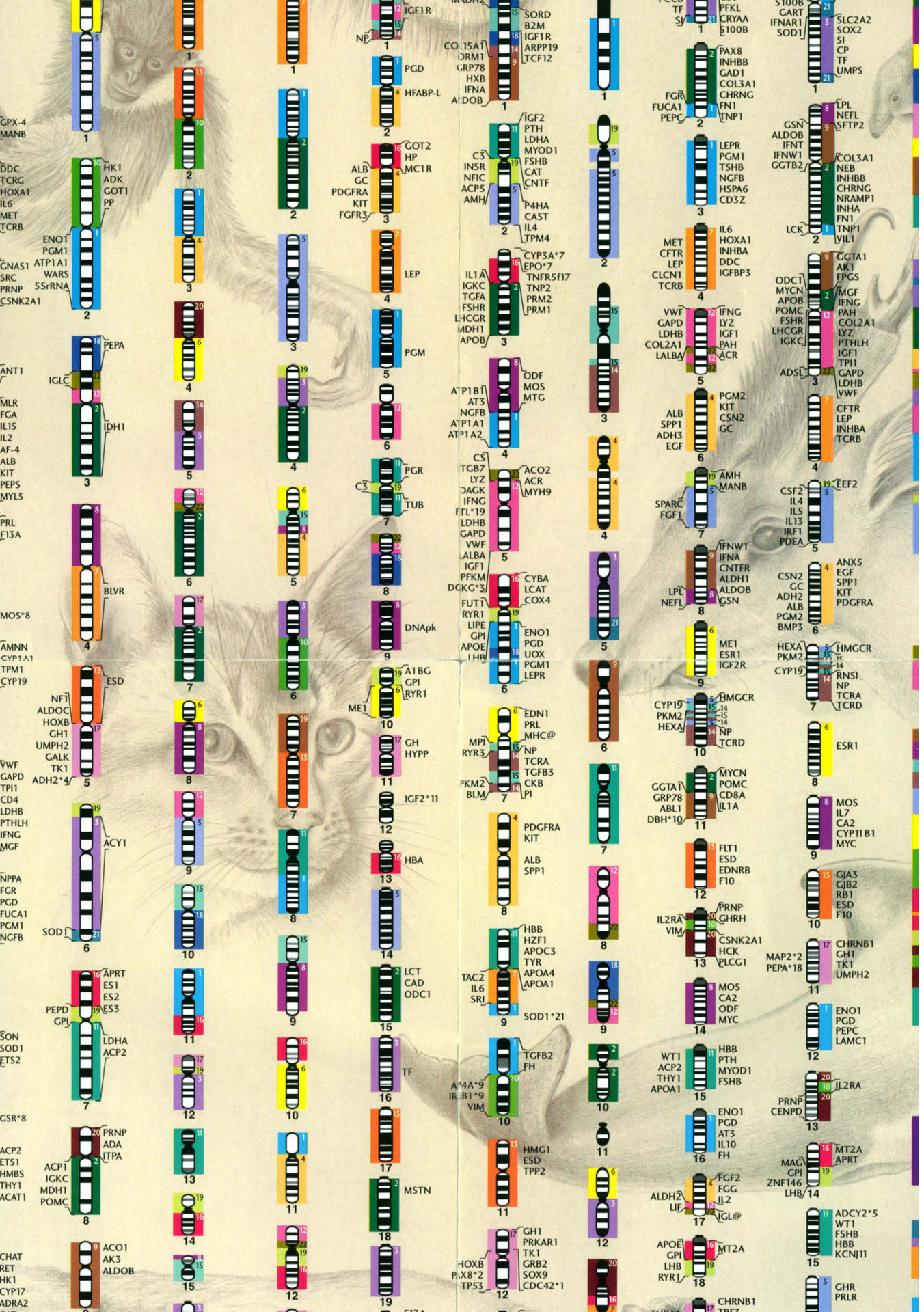


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Gpi1
Cebpa
Pep4
Tyr
Pth
Oat
Th
Igf1r
Fah
Mod2
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Atp4b
Il15
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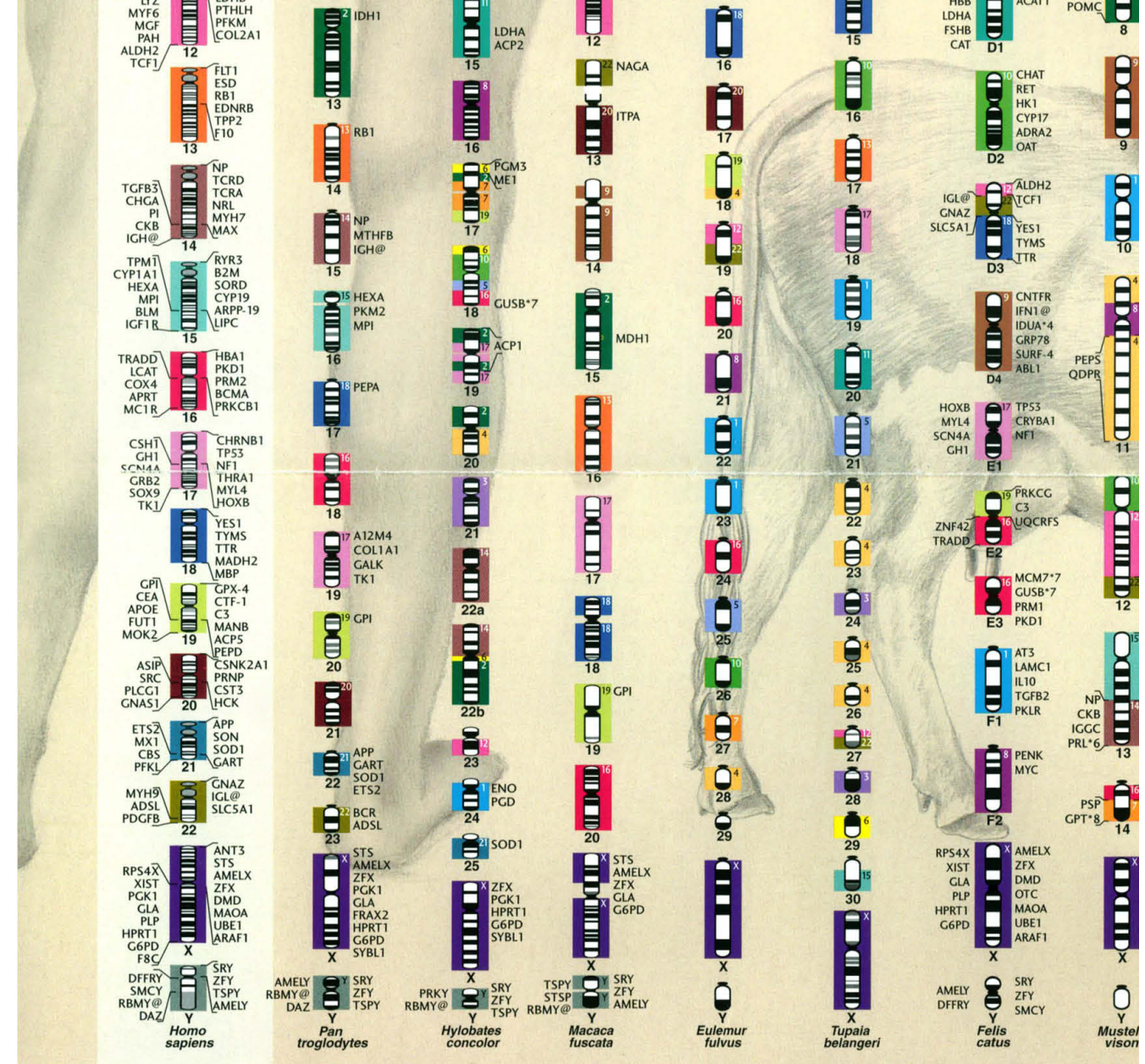

HUMAN CHROMOSOME COLOR KEY

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	X	Y

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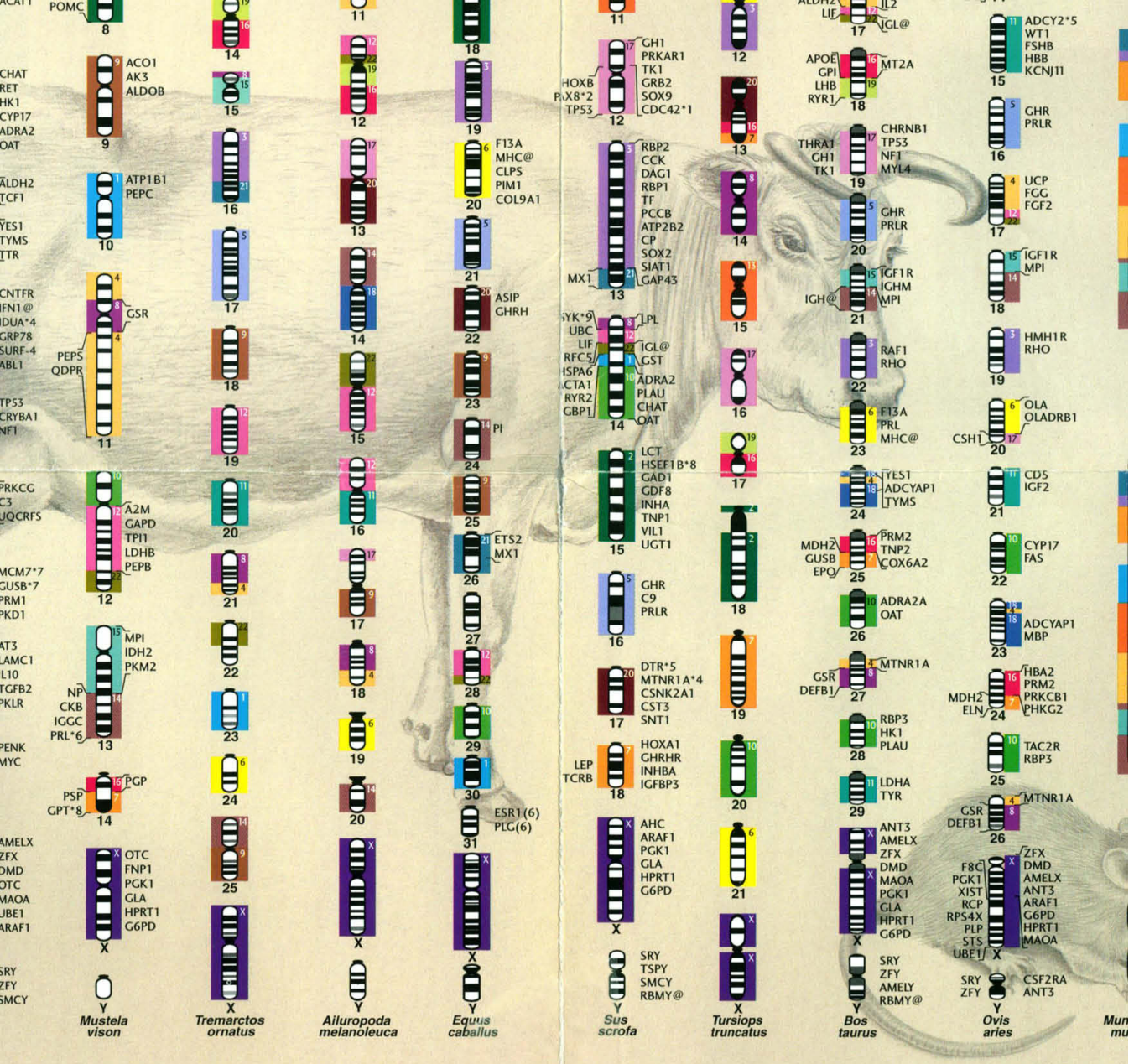

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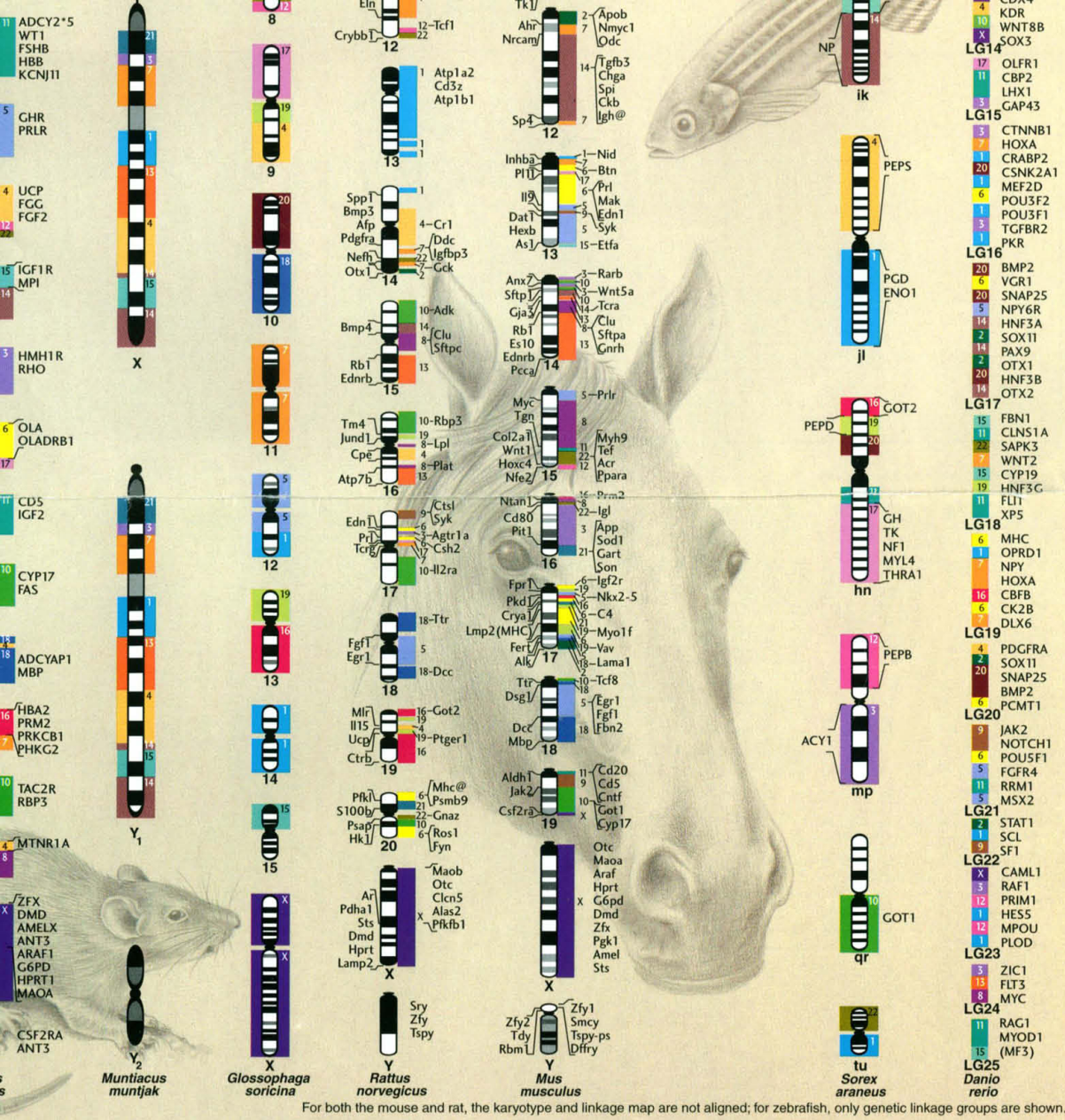

For both the mouse and rat, the karyotype and linkage map are not aligned; for zebrafish, only genetic linkage groups are shown.

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…search, Invermay,
…g Serov, Institute of
…irsk, Russia; Ernie
…ntre for Human
…nima, Japan;
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