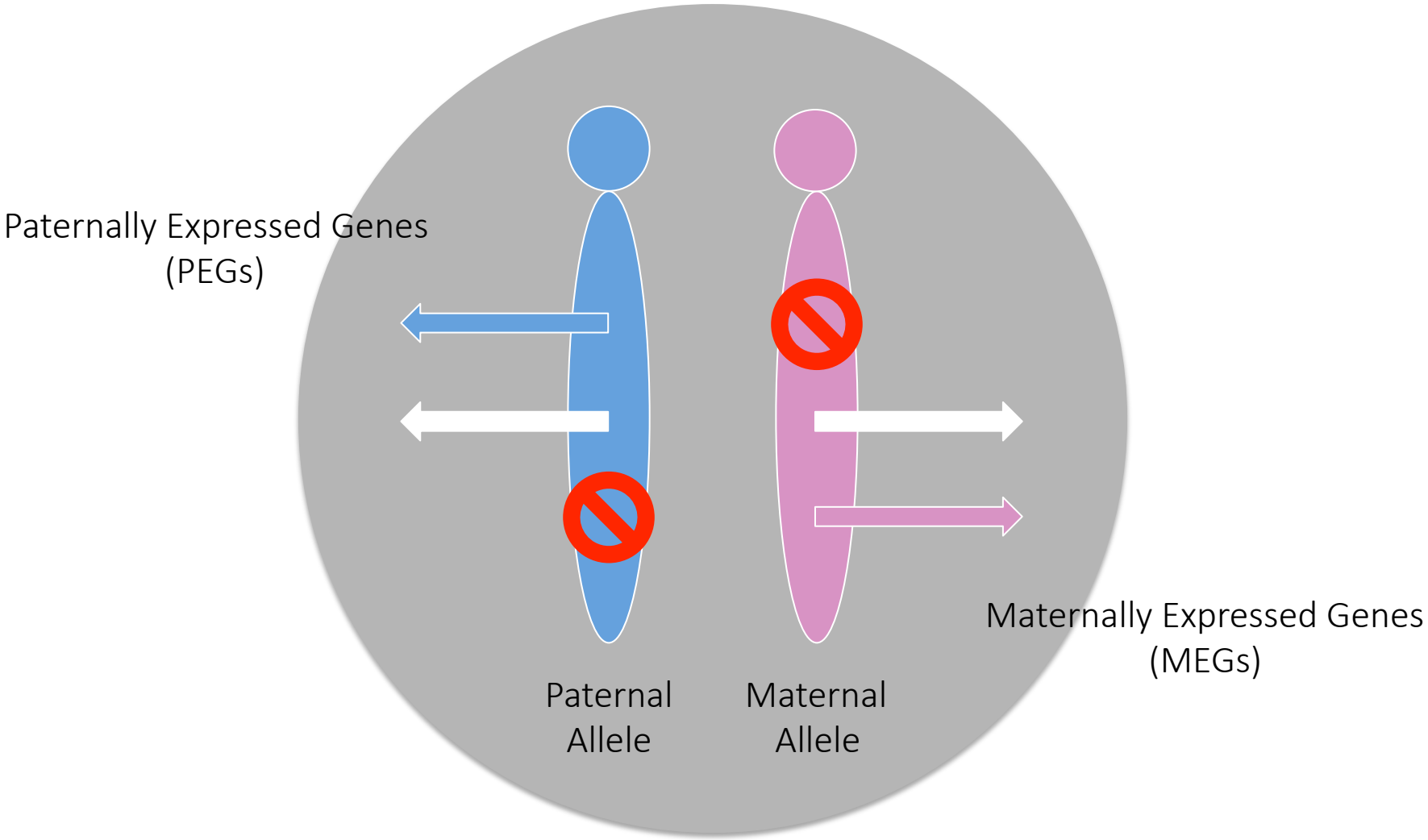
Emergence of novel CpG island is the key genomic change for the evolution of mammalian genomic imprinting

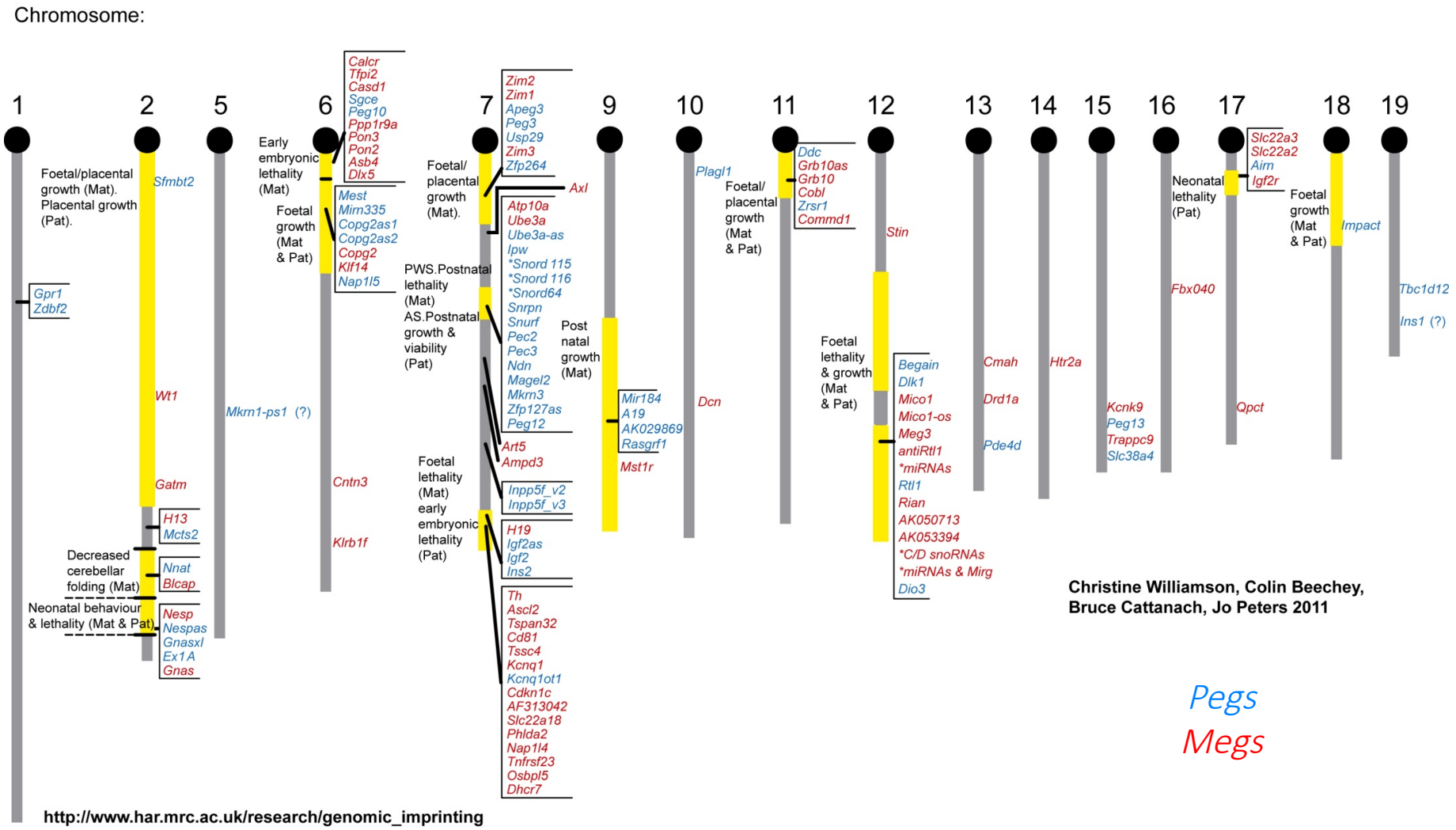
Shunsuke Suzuki, PhD

Assistant Professor
Epigenomics Division
Frontier Agriscience and Technology Center
Faculty of Agriculture
Shinshu University
Japan

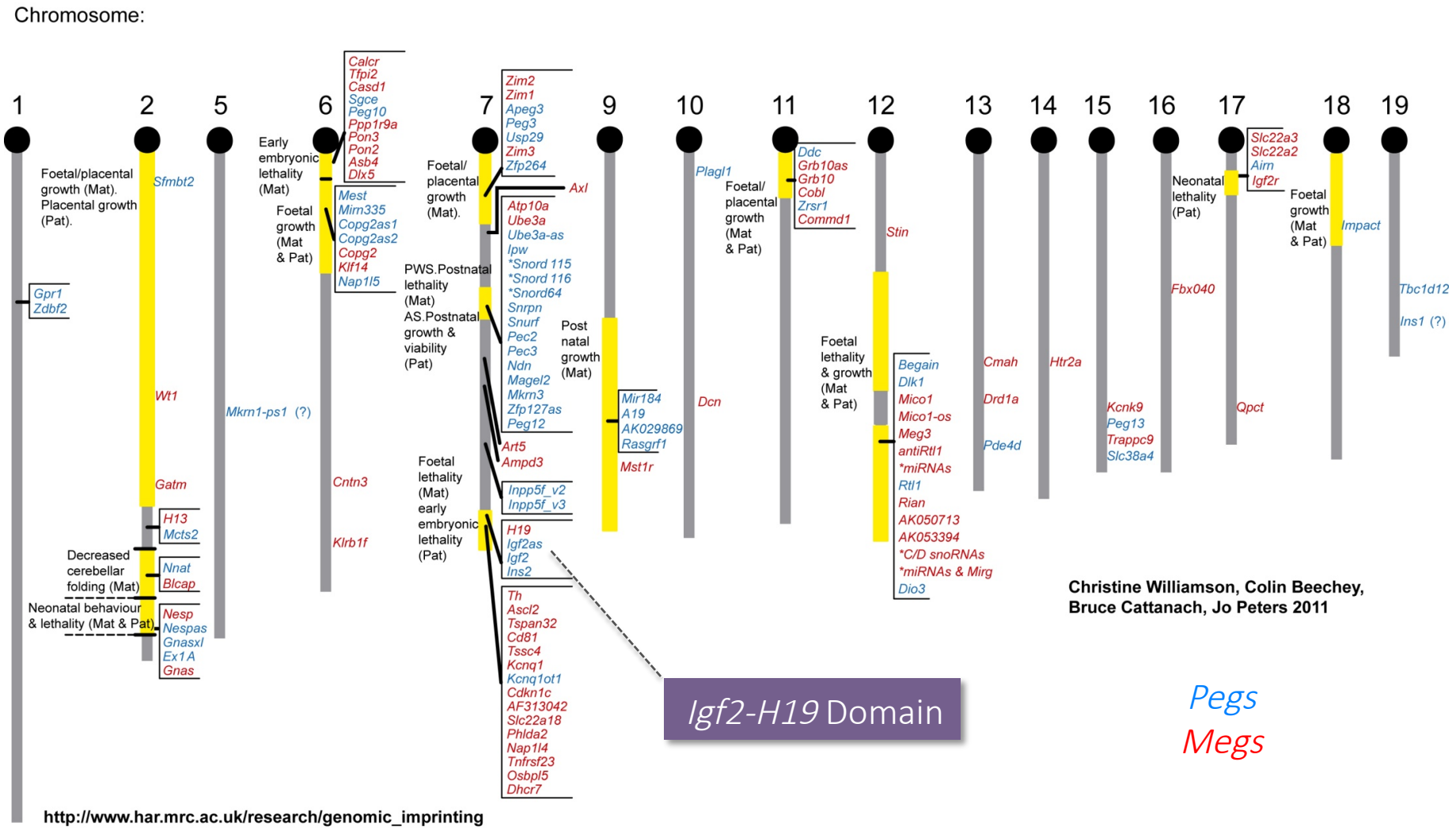
Genomic imprinting produces functional difference between paternal and maternal genomes



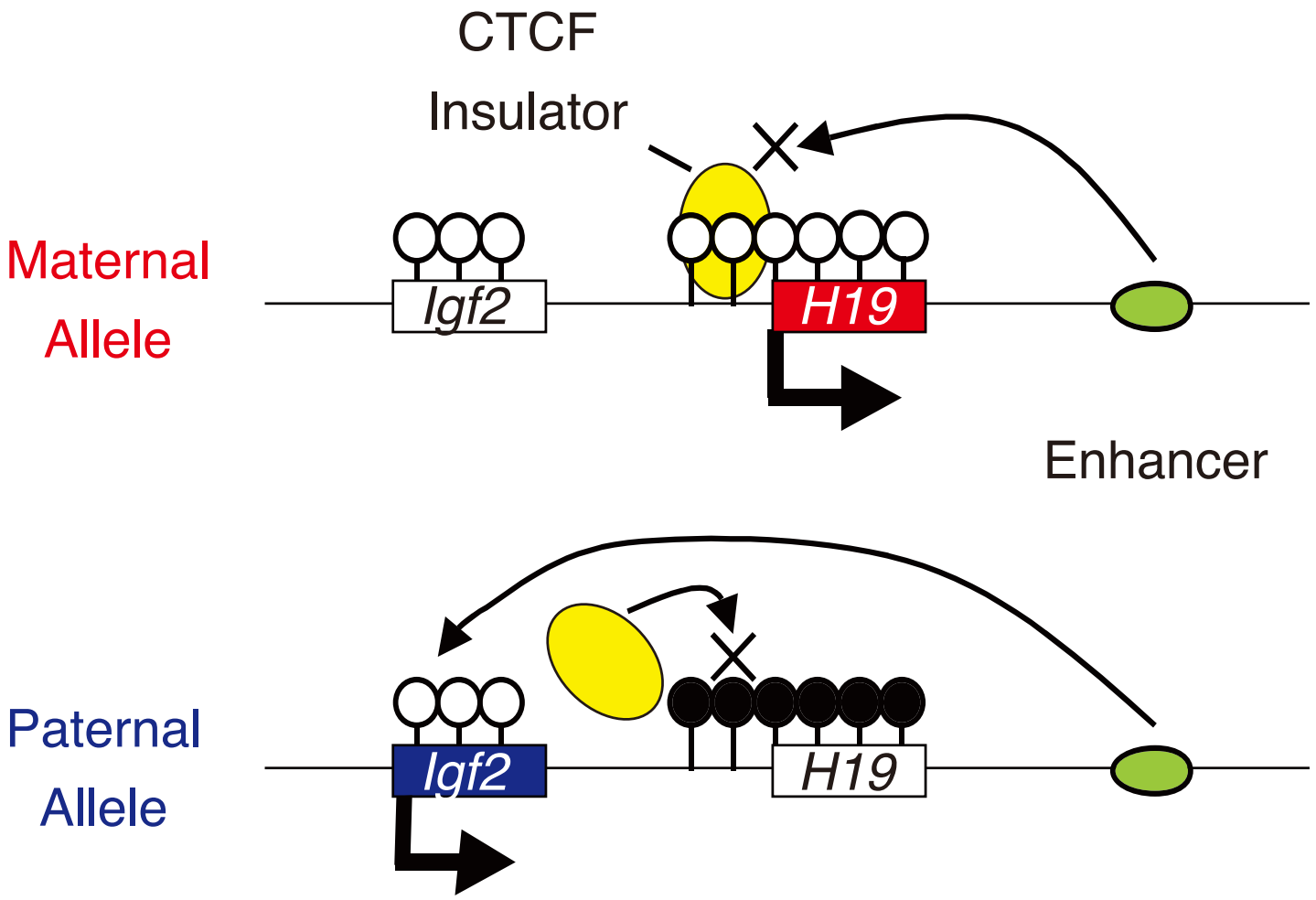
Mouse imprinted genes, regions and phenotypes



Mouse imprinted genes, regions and phenotypes

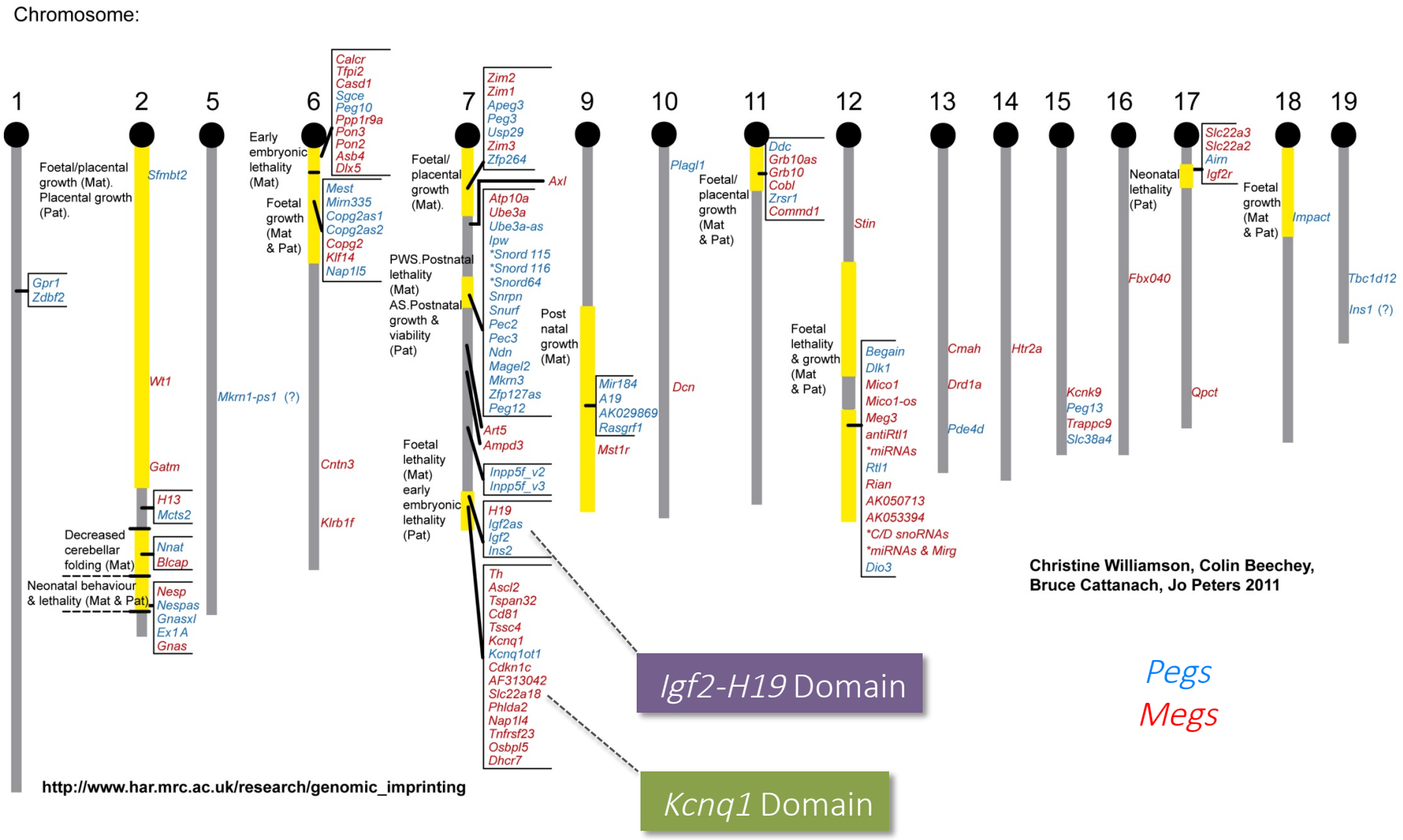


Imprinting control by the *H19* DMR (differentially methylated region)

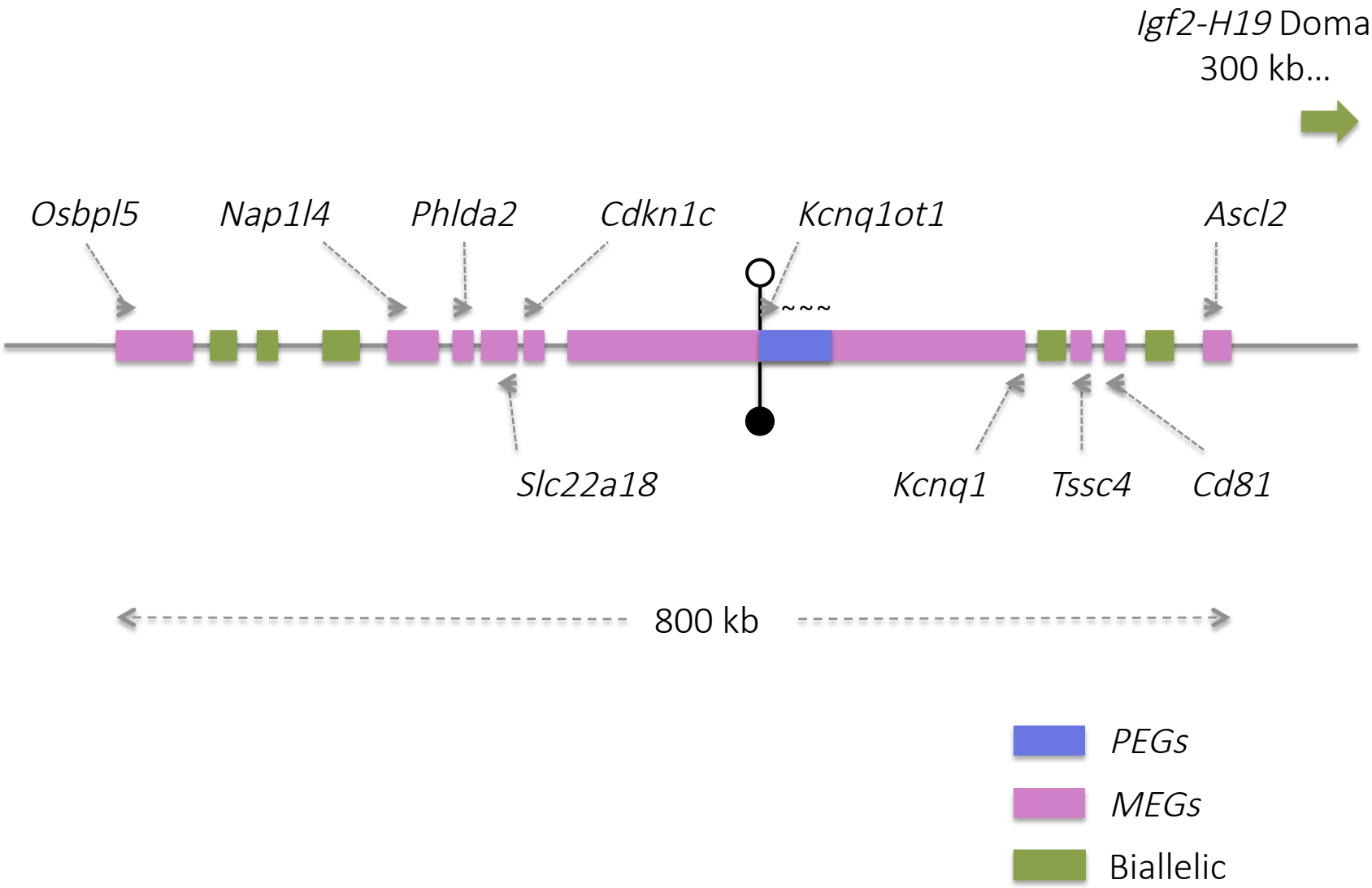


Renfree MB, Suzuki S, Kaneko-Ishino T. *Philos Trans R Soc Lond B Biol Sci.* 2013

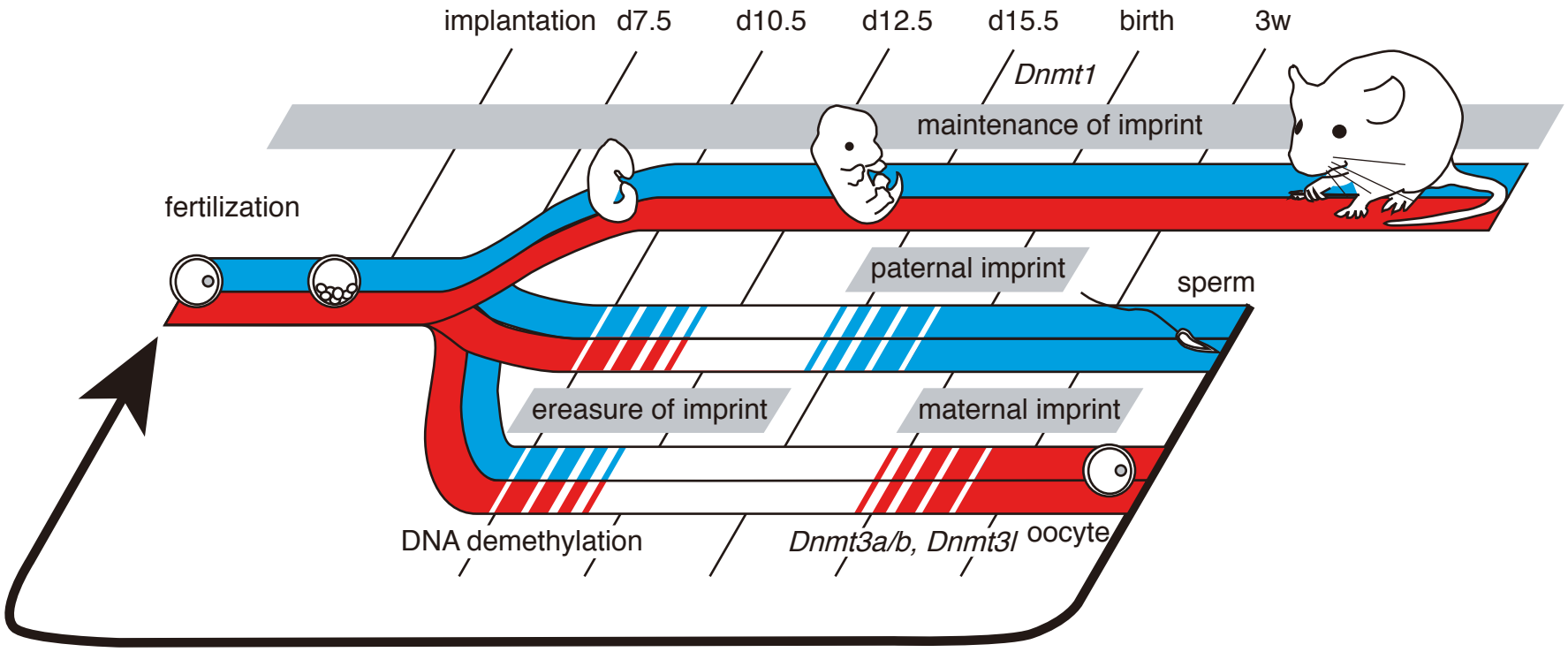
Mouse imprinted genes, regions and phenotypes



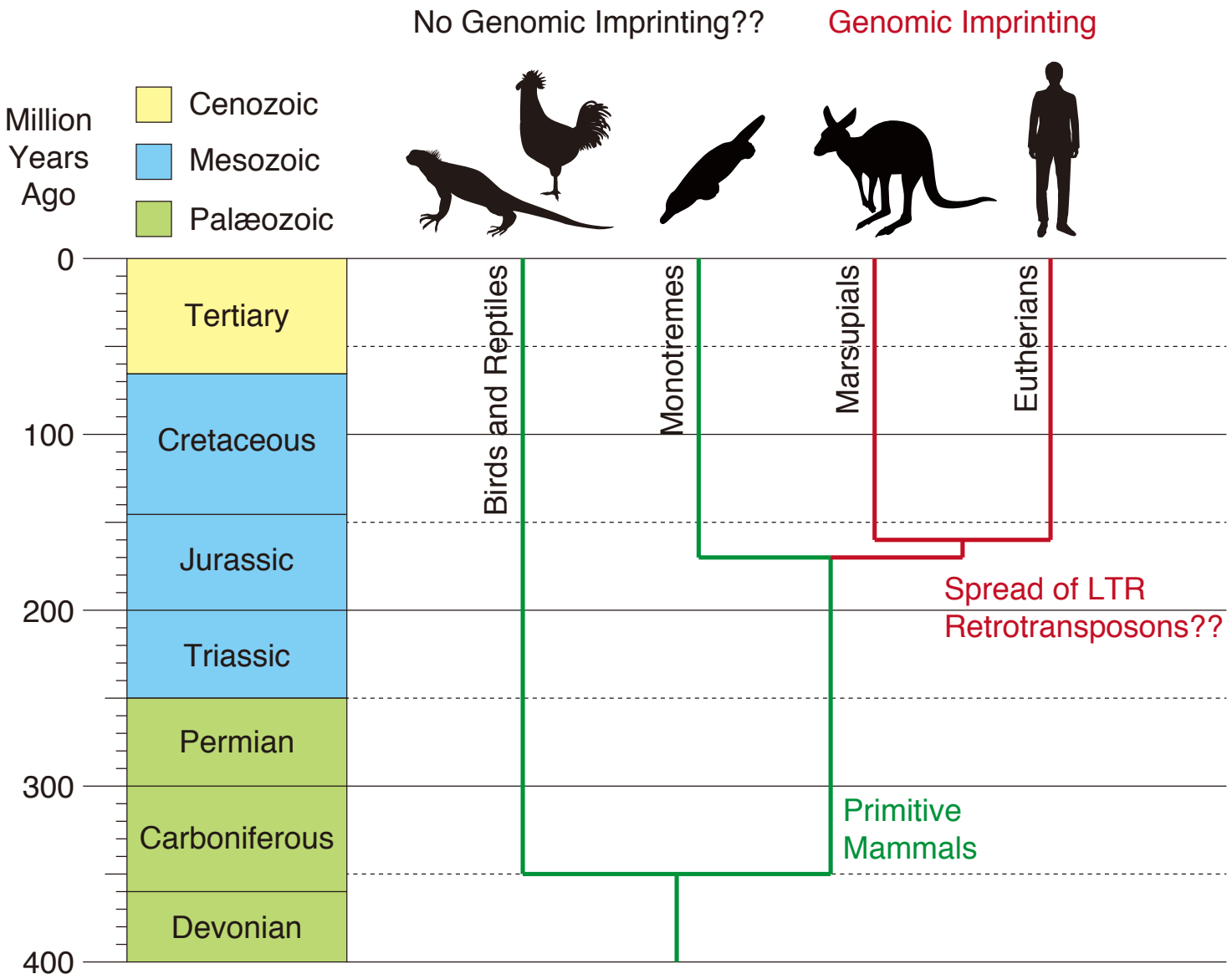
The *Kcnq1* imprinted domain is controlled by the kvDMR



Erasure and re-establishment of methylation imprints at DMRs

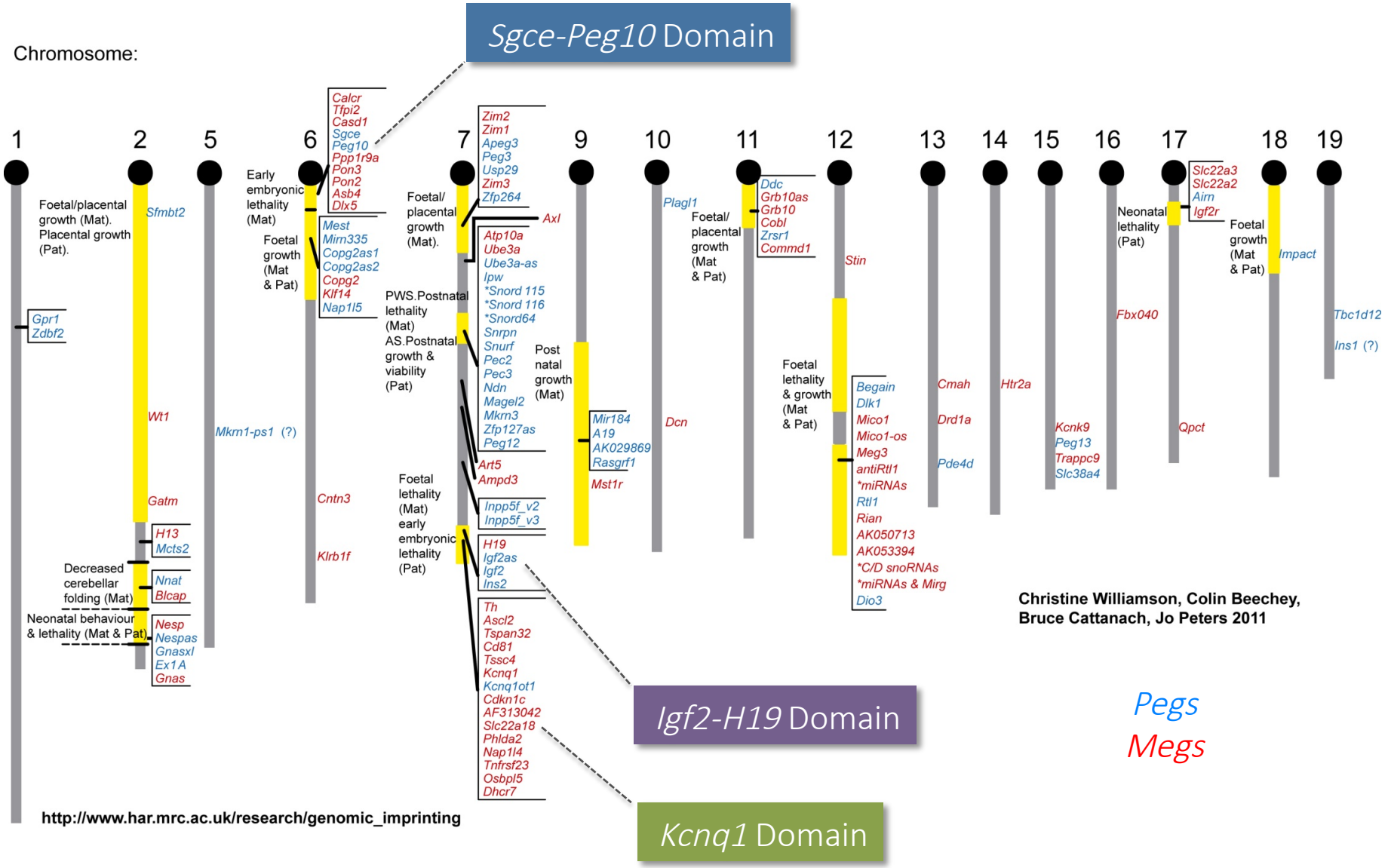


Only viviparous mammals have genomic imprinting

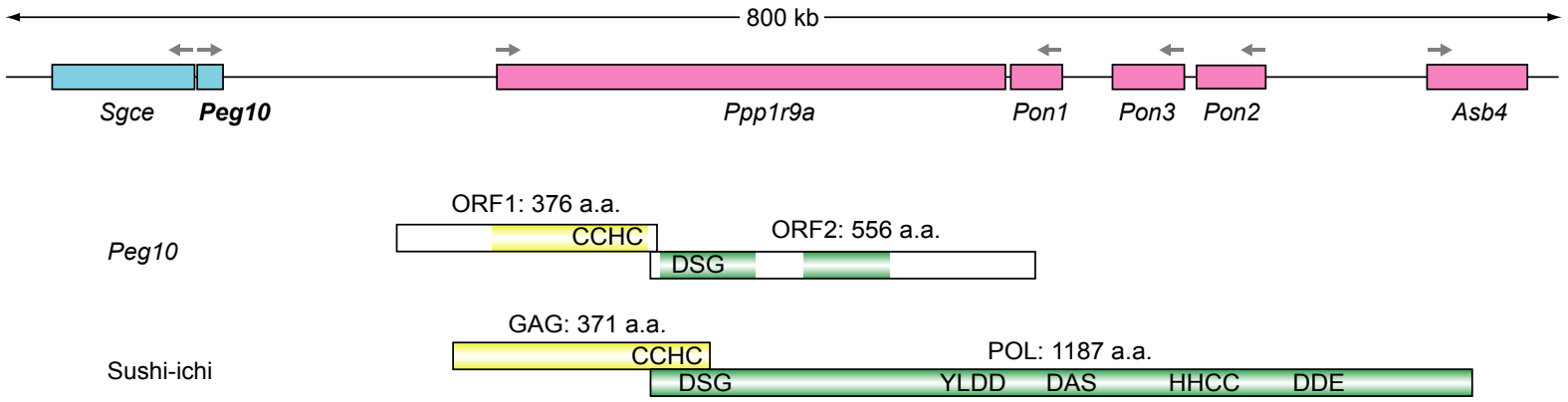


Renfree MB, Suzuki S, Kaneko-Ishino T. *Philos Trans R Soc Lond B Biol Sci.* 2013

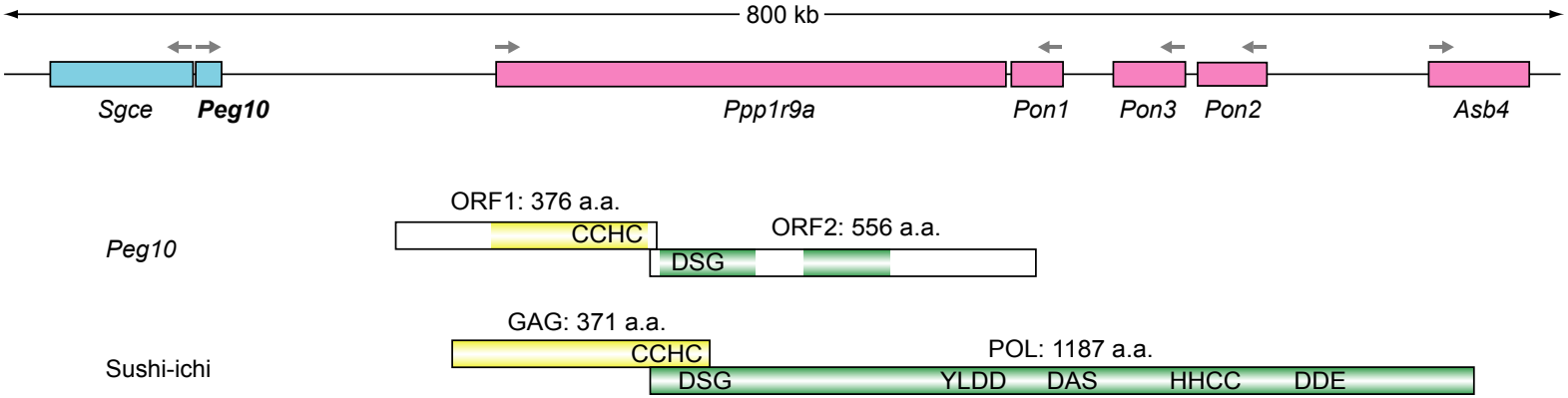
Mouse imprinted genes, regions and phenotypes



Peg10 shares homology with Sushi-ichi retrotransposon

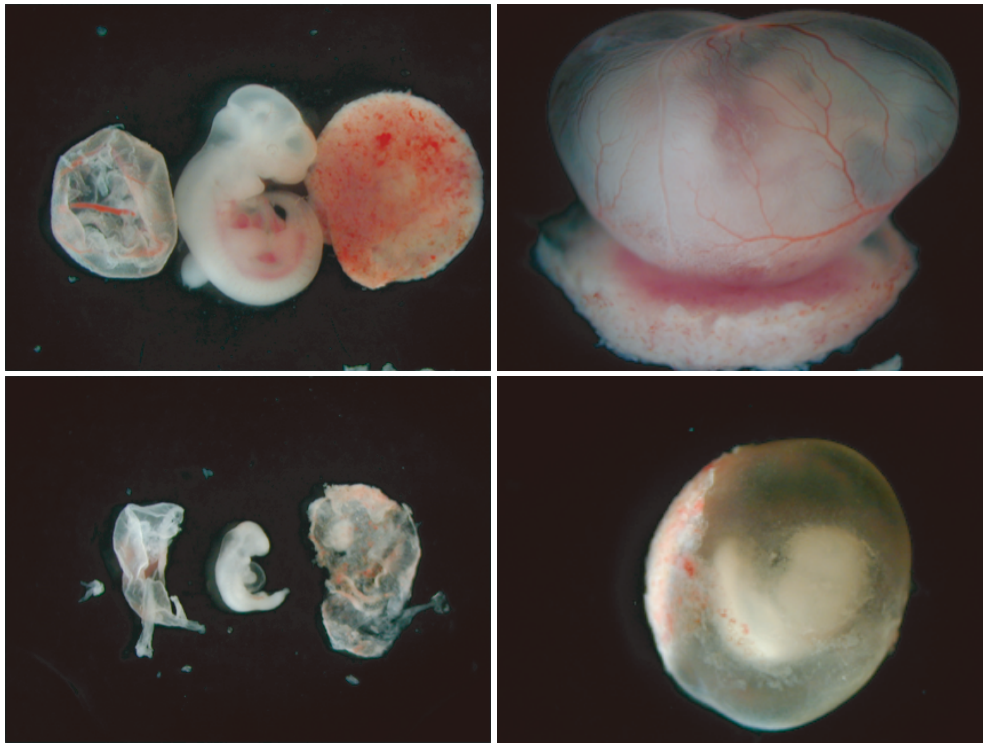


Peg10 is essential for placental development



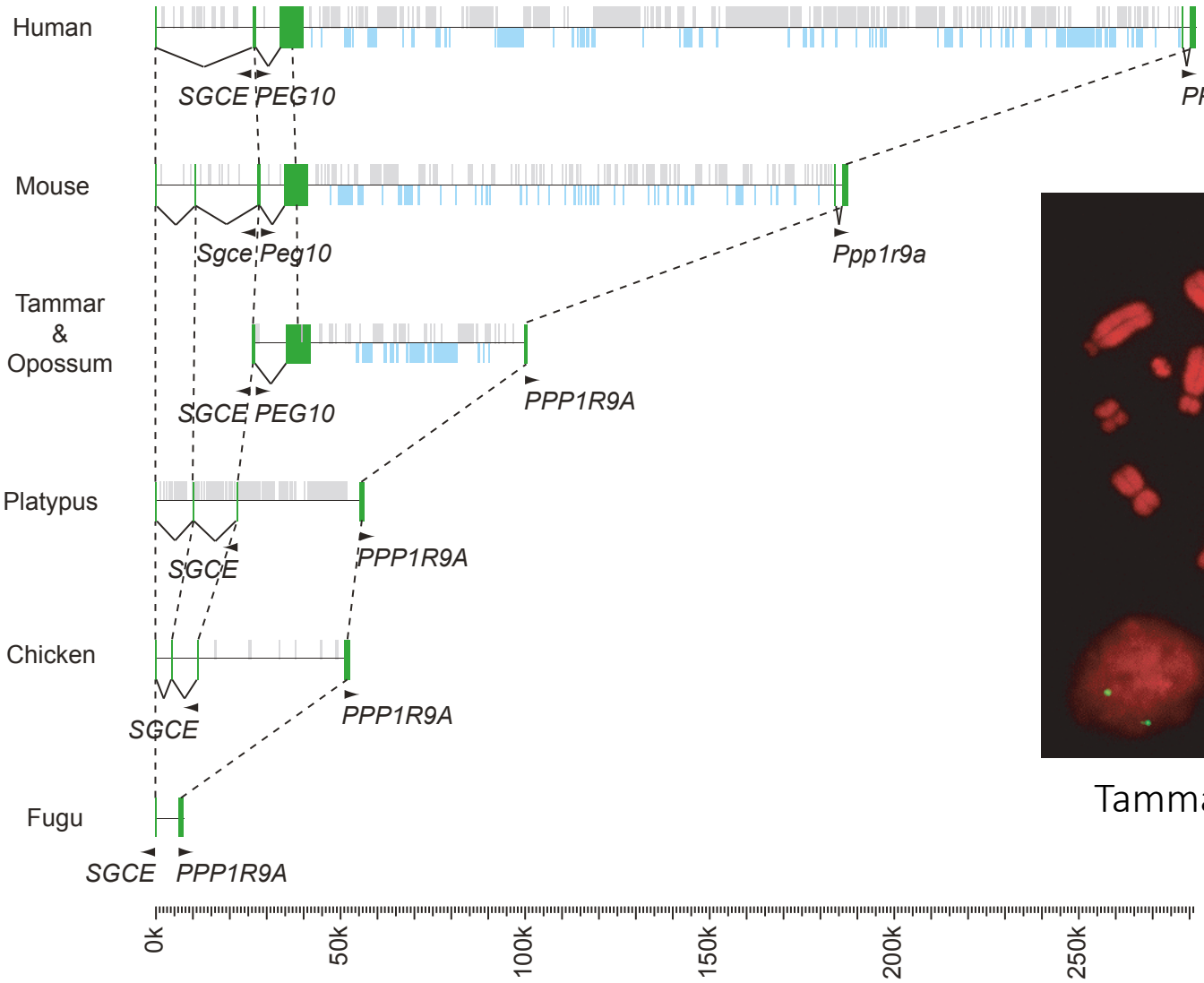
WT
(e 10.5)

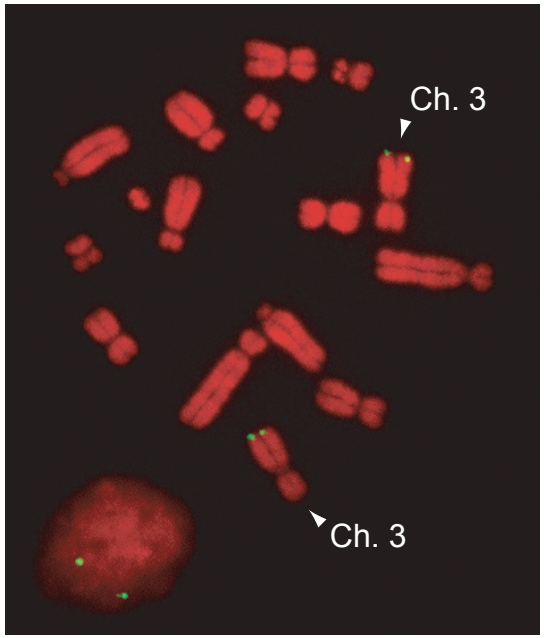
KO
(e 10.5)



Ono R *et al. Nat Genet.* 2006

PEG10 is found in marsupials, but not in monotremes

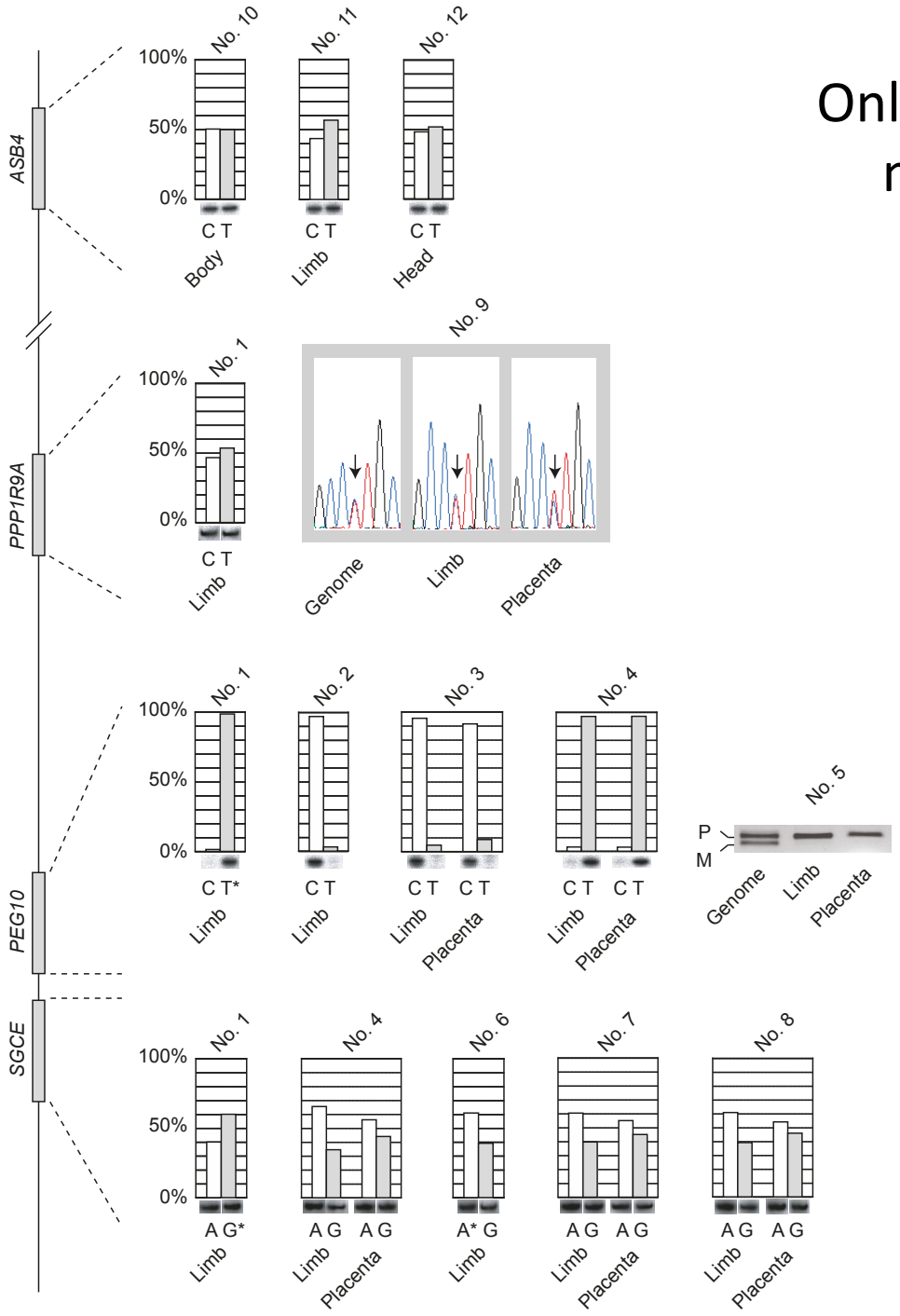




Tammar *PEG10* locus

Suzuki S *et al. PLoS Genet.* 2007

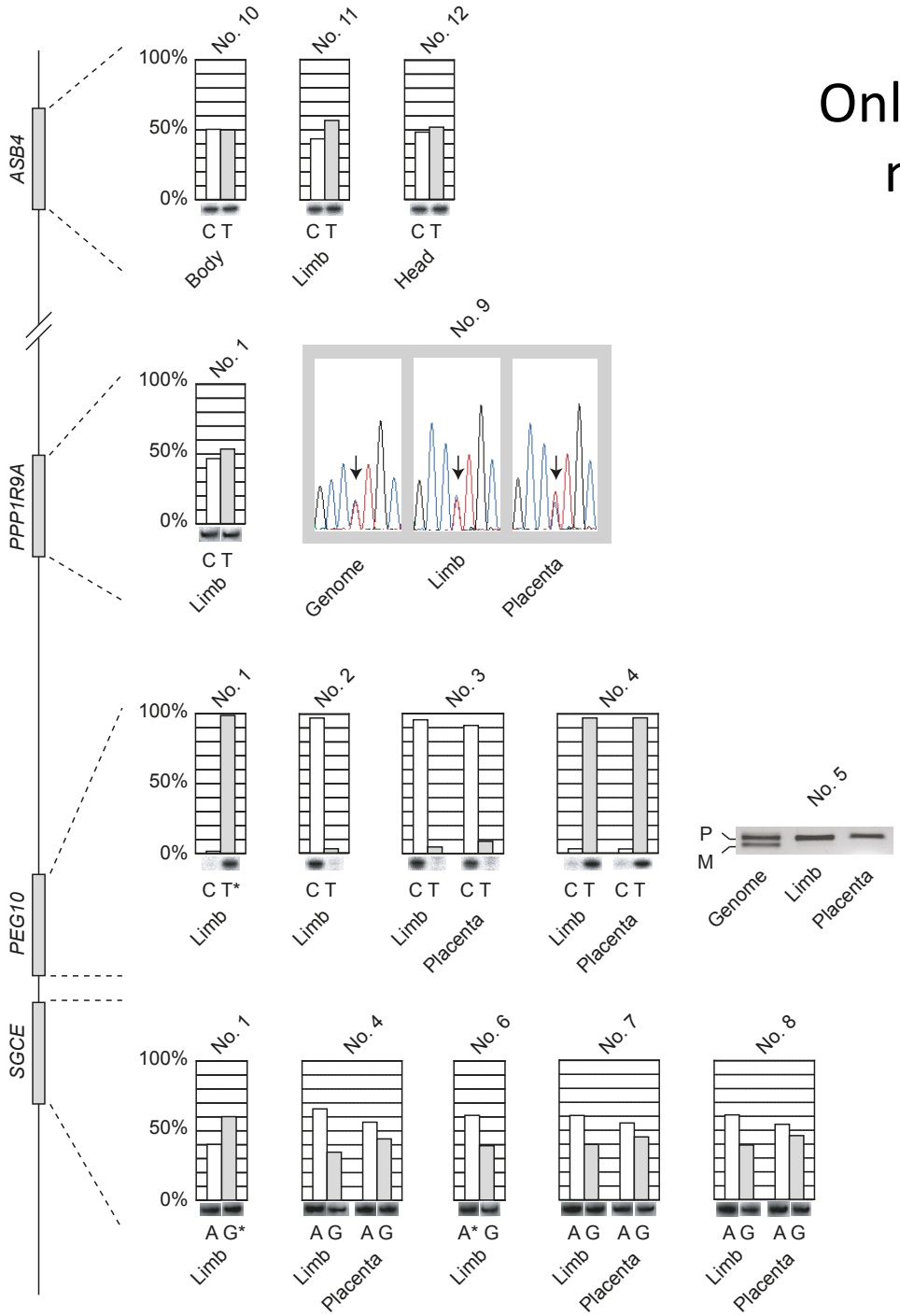
Only *PEG10* is imprinted in the marsupial *PEG10* domain

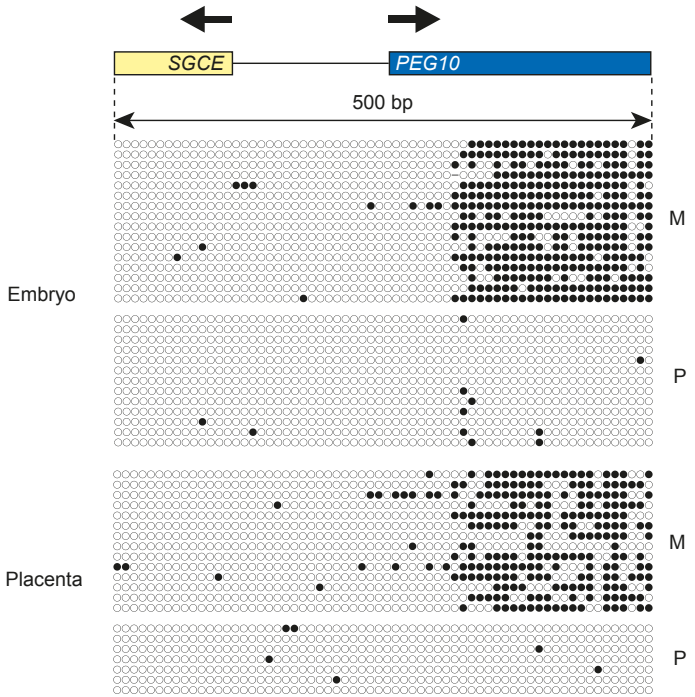


Suzuki S *et al. PLoS Genet.* 2007

Only *PEG10* is imprinted in the marsupial *PEG10* domain

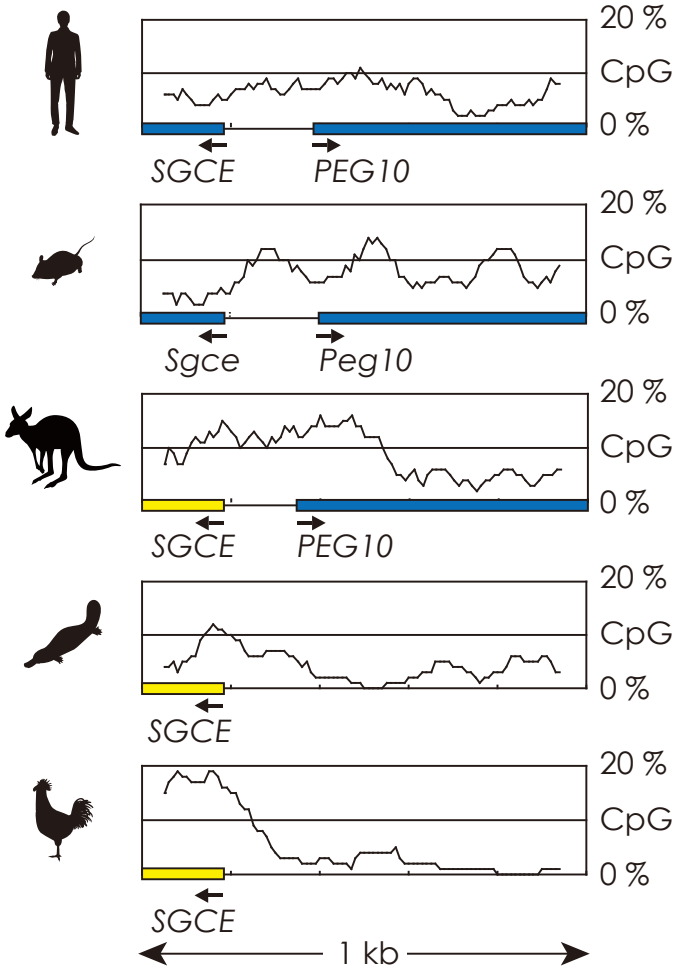
Only *PEG10* side is differentially methylated

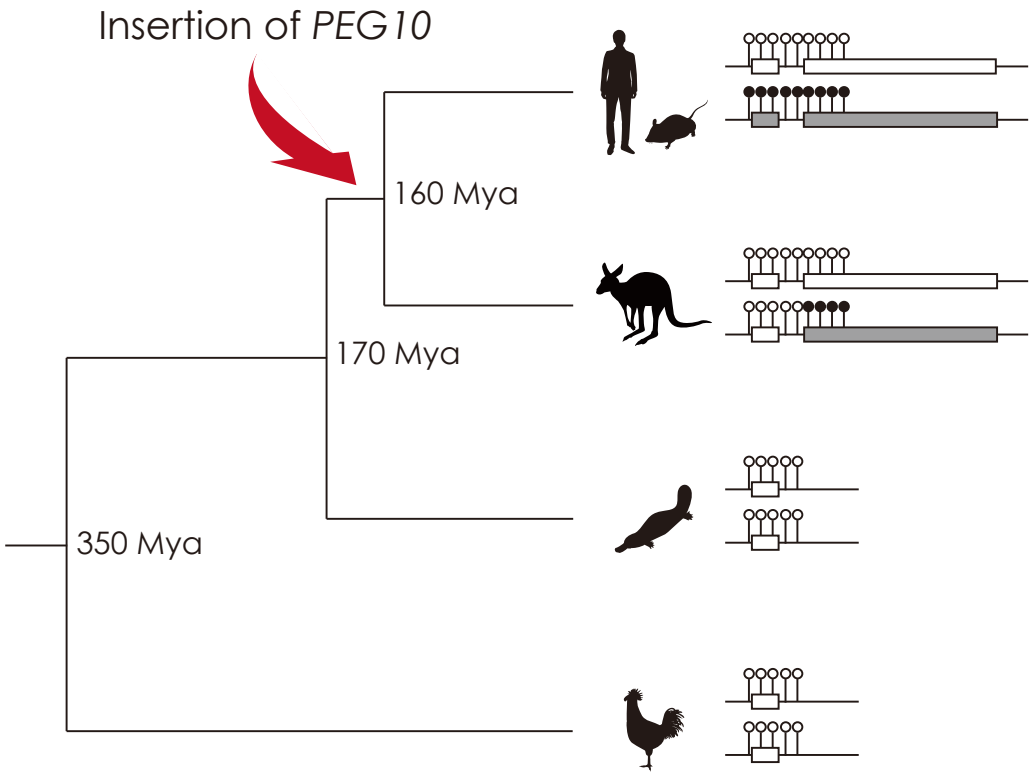




Suzuki S *et al. PLoS Genet.* 2007

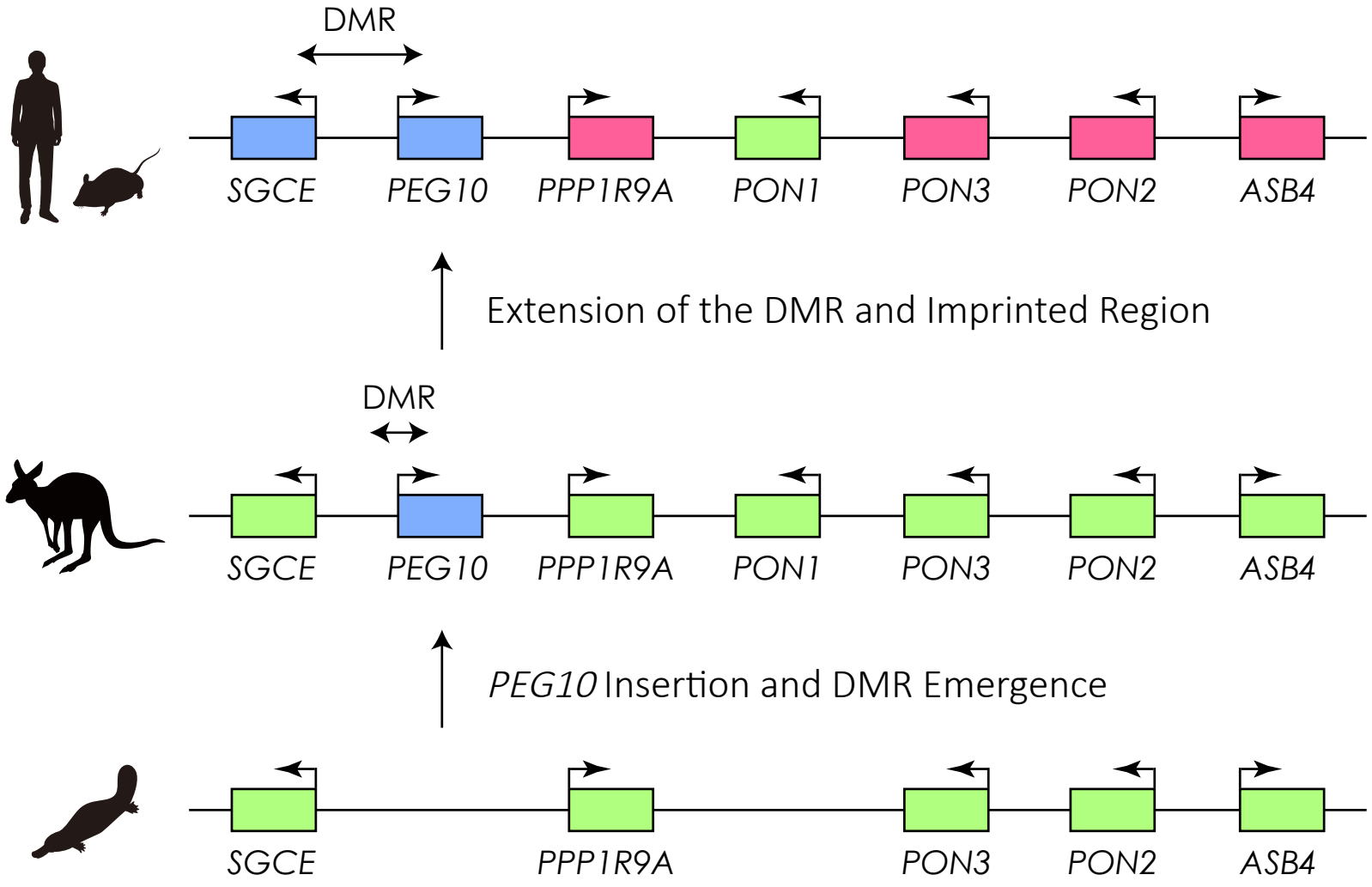
The tammar DMR corresponds to the extended part of the CpG island after the *PEG10* insertion



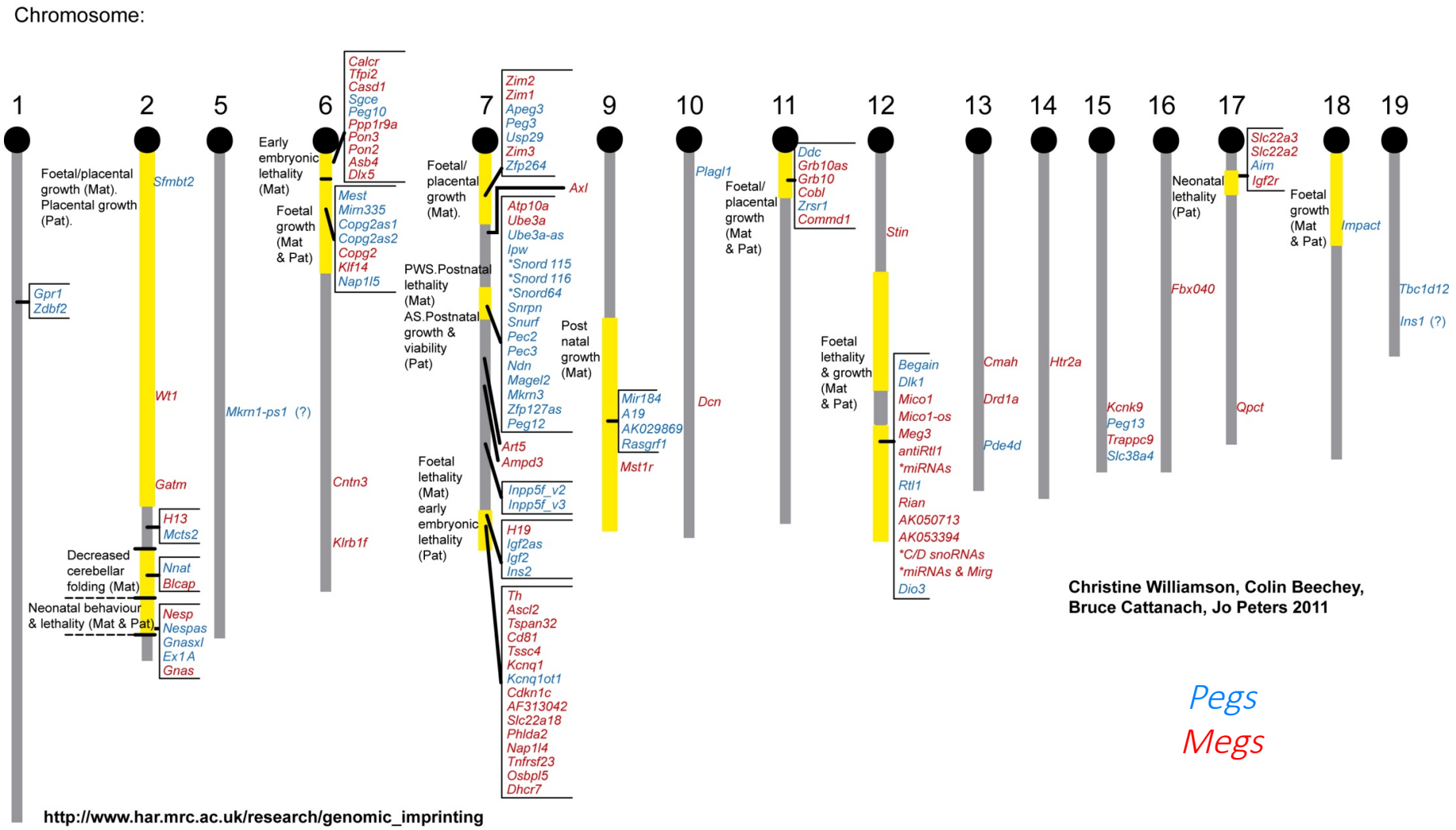


Suzuki S *et al. PLoS Genet.* 2007

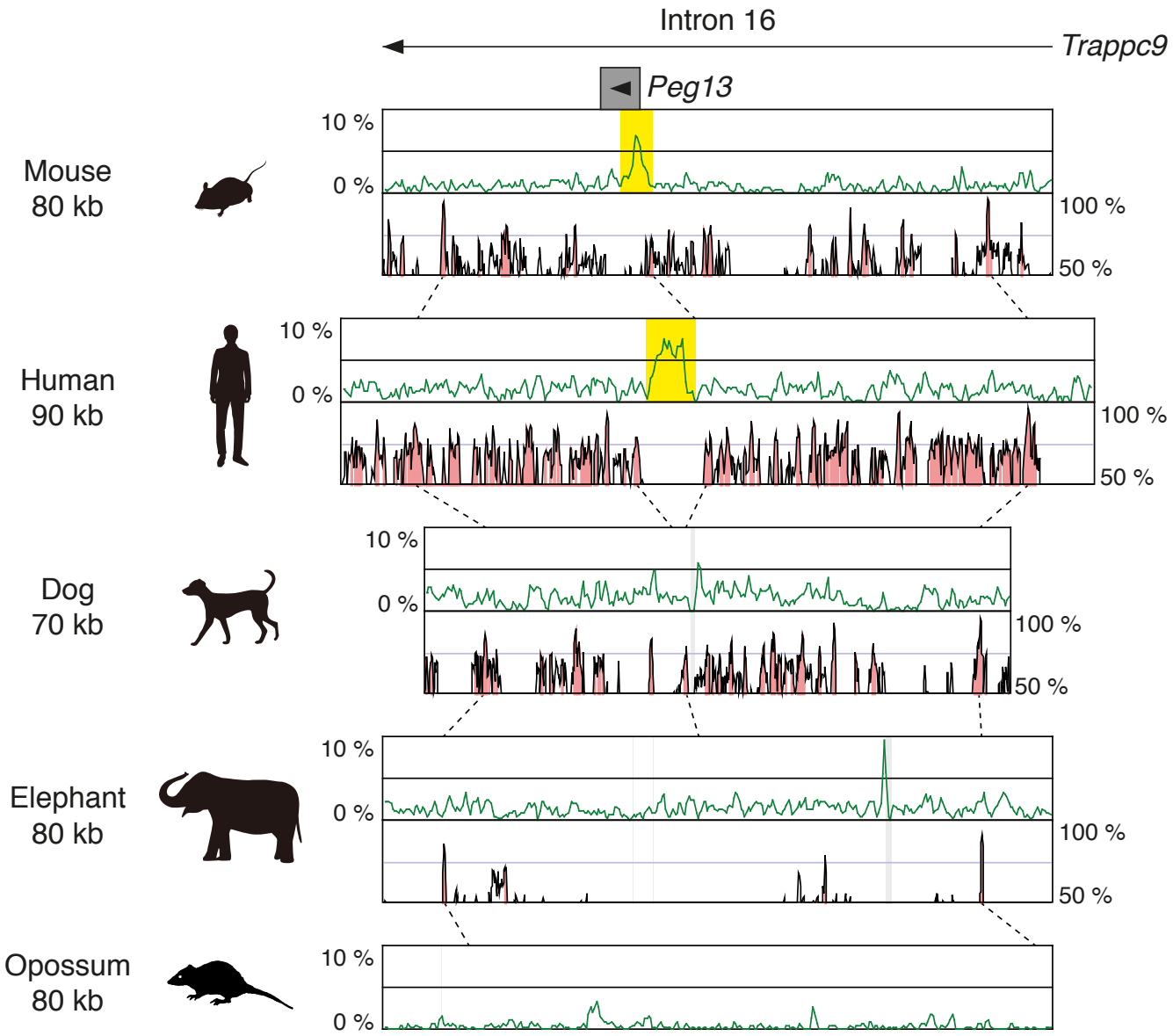
PEG10 insertion was the origin of imprinting of the *SGCE-PEG10* domain



Mouse imprinted genes, regions and phenotypes



Peg13 CGI emerged after the Laurasiatheria divergence



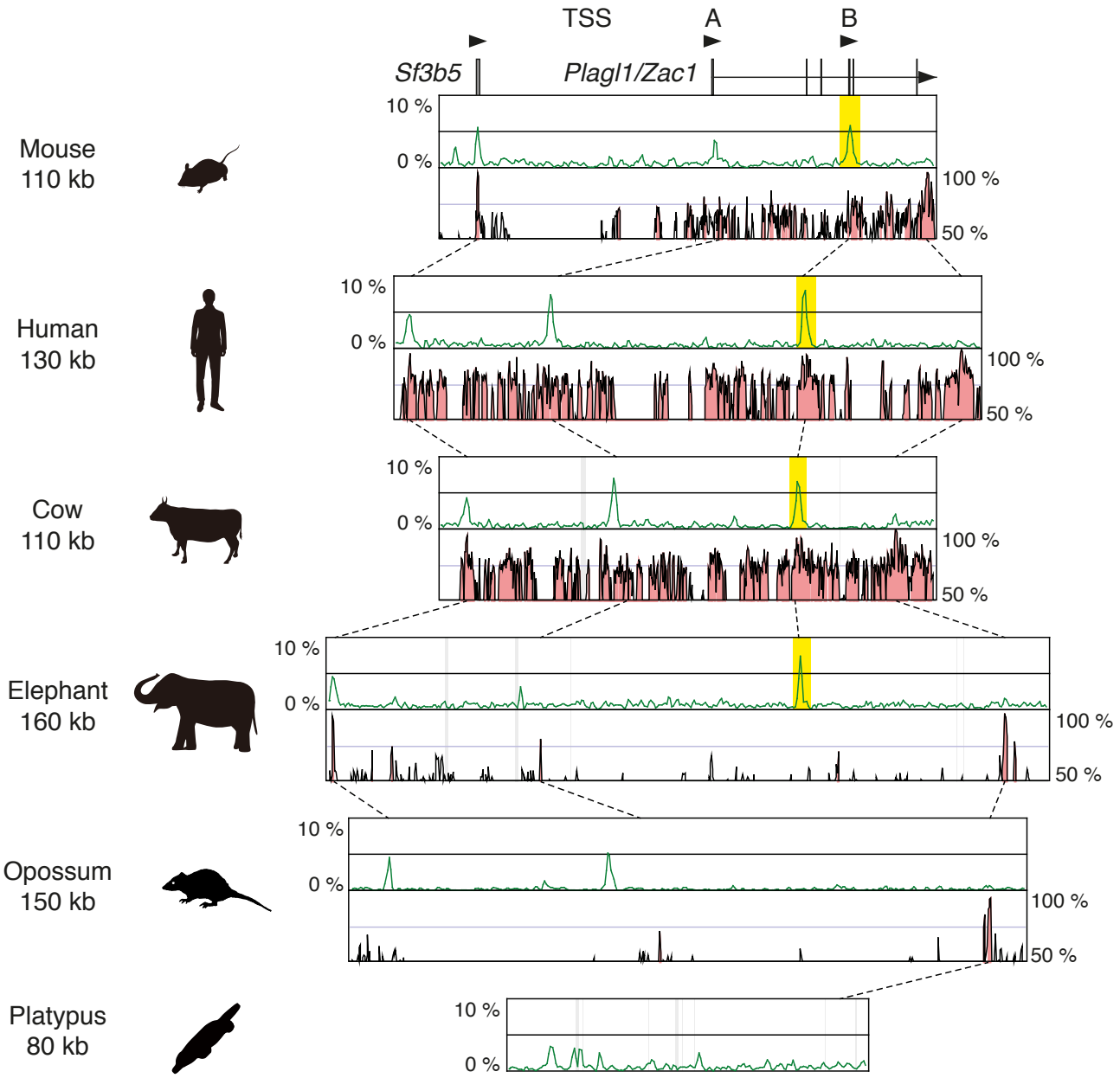
Suzuki S *et al. Genome Biol Evol.* 2011

Grb10 downstream CGI emerged in the eutherian ancestor



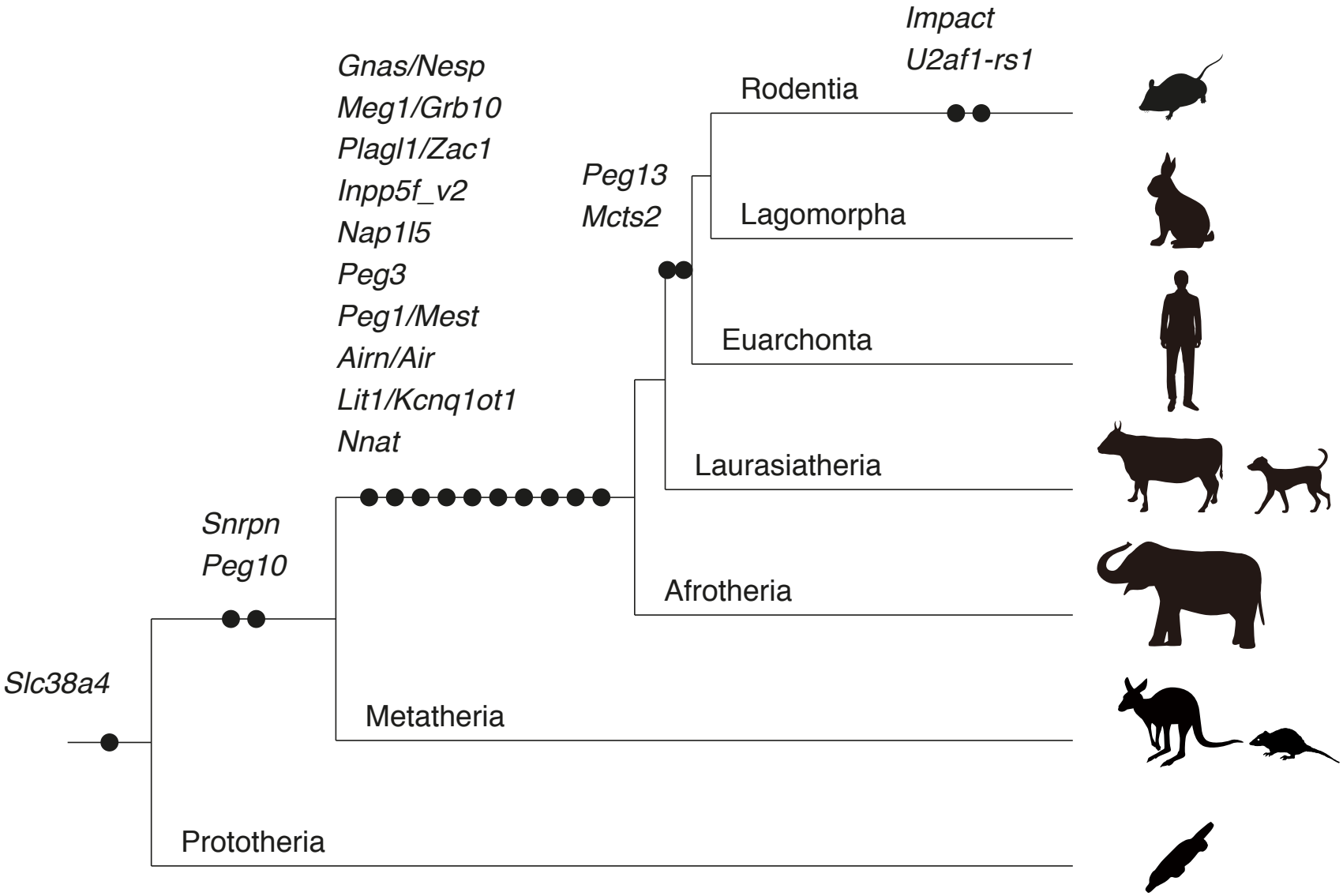
Suzuki S *et al. Genome Biol Evol.* 2011

Plagl1 downstream CGI emerged in the eutherian ancestor



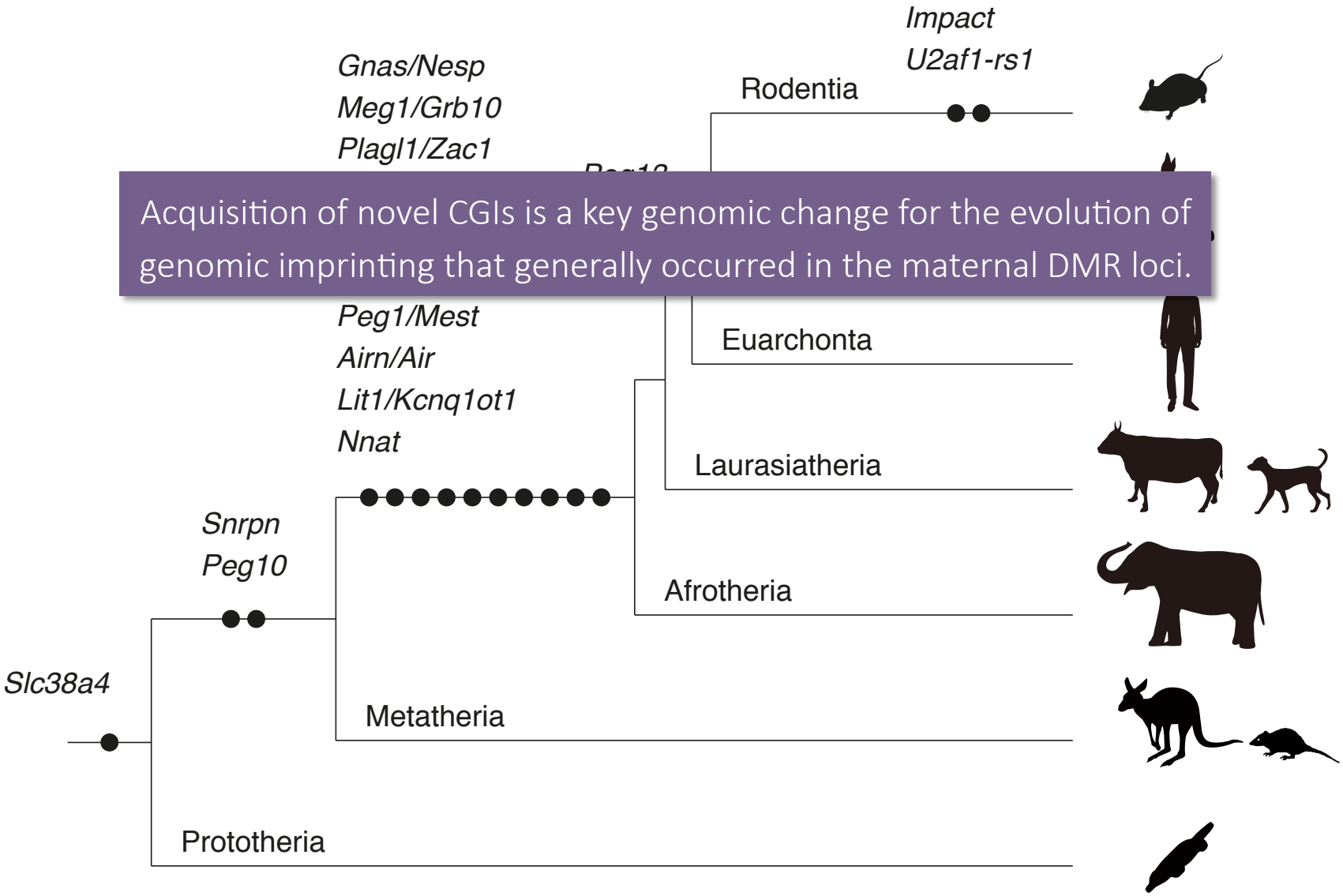
Suzuki S *et al. Genome Biol Evol.* 2011

Many DMRs emerged as novel CGIs at various time points during mammalian evolution



Suzuki S *et al. Genome Biol Evol.* 2011

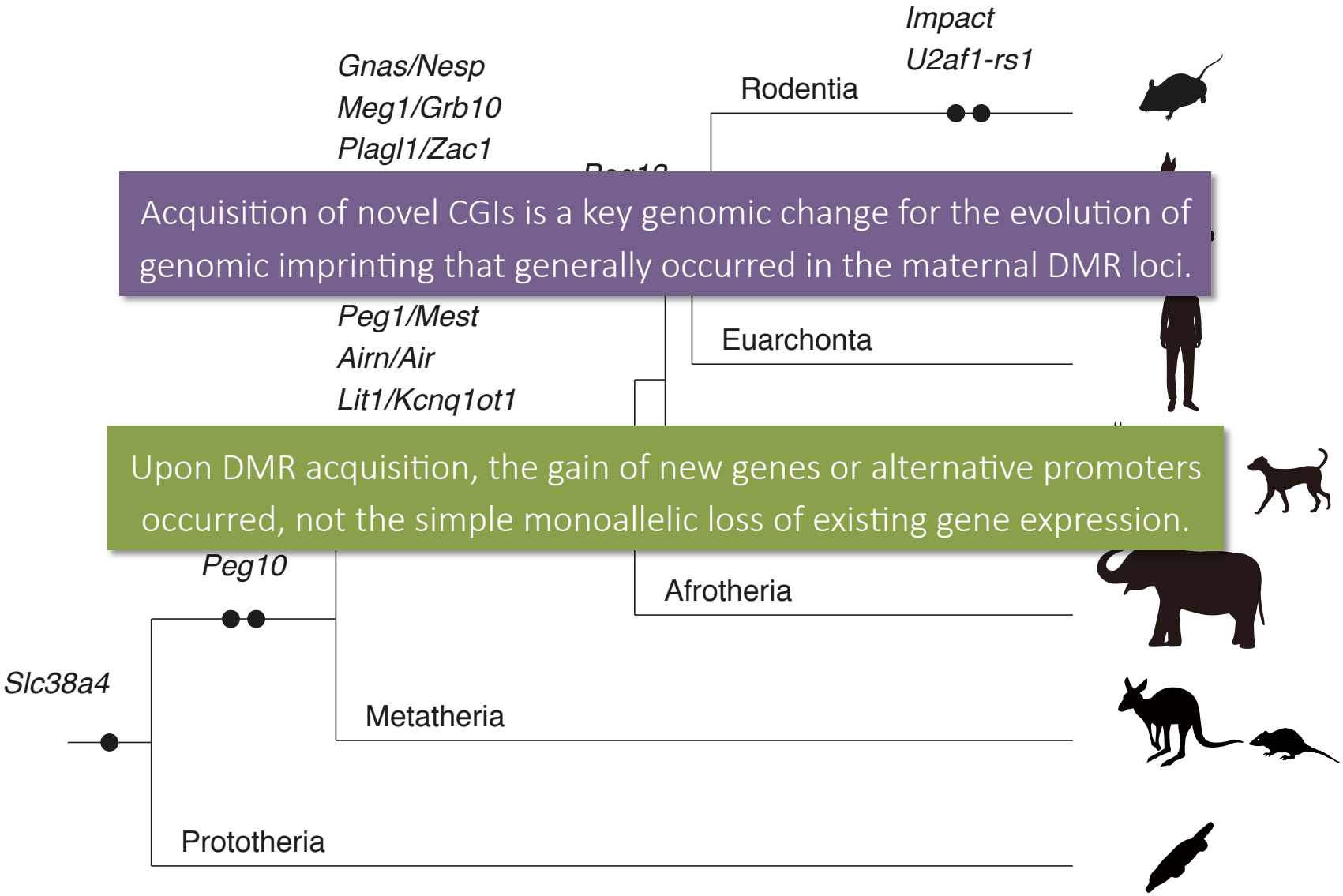
Many DMRs emerged as novel CGIs at various time points during mammalian evolution



Acquisition of novel CGIs is a key genomic change for the evolution of genomic imprinting that generally occurred in the maternal DMR loci.

Suzuki S *et al. Genome Biol Evol.* 2011

Many DMRs emerged as novel CGIs at various time points during mammalian evolution



Suzuki S *et al. Genome Biol Evol.* 2011