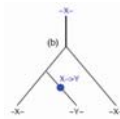


Recombination Drives the Evolution of isochores

Julien Meunier, K. Adel, Vincent Navratil, Dominique Mouchiroud, Laurent Duret

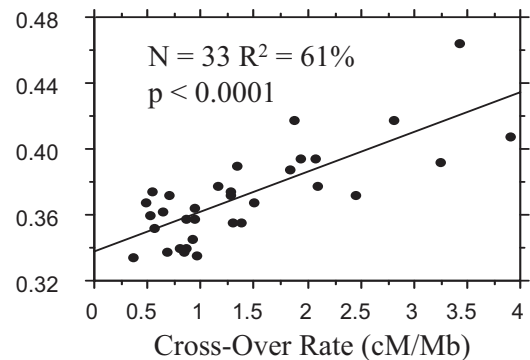
Substitution patterns in primates

- Human, chimp, baboon alignments:
 - 14.3 Mb (introns and intergenic regions)
 - 36 loci from 12 autosomes
- Substitutions inferred by parsimony



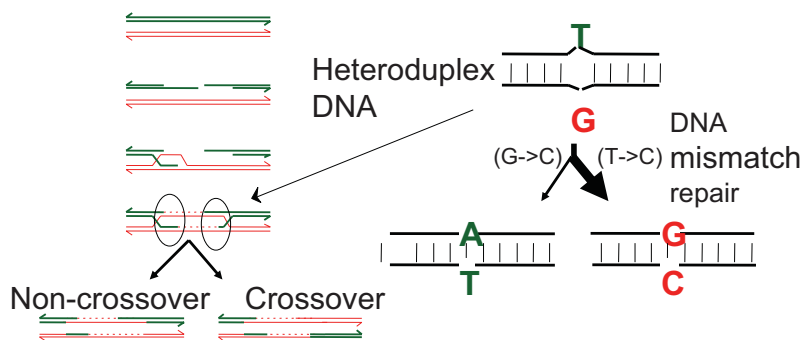
- Future equilibrium GC-content (GC*) inferred from recent substitution rates

Equilibrium GC-content GC*



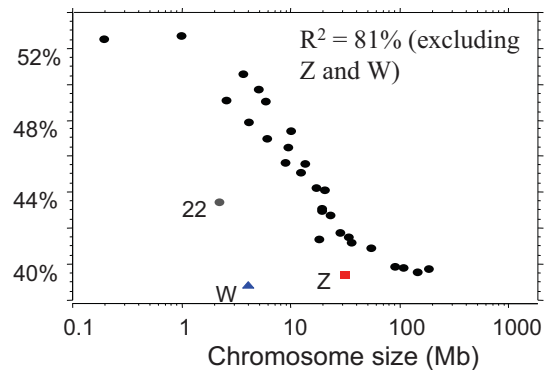
Biased gene conversion (BGC)

Molecular events of meiotic recombination



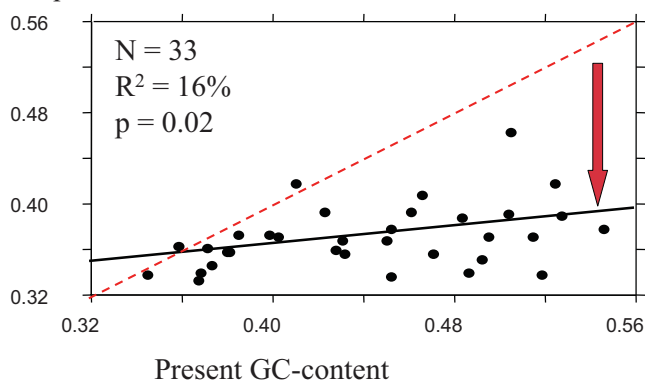
Length of chromosome arms, recombination rate and GC-content

GC-content of chicken chromosomes

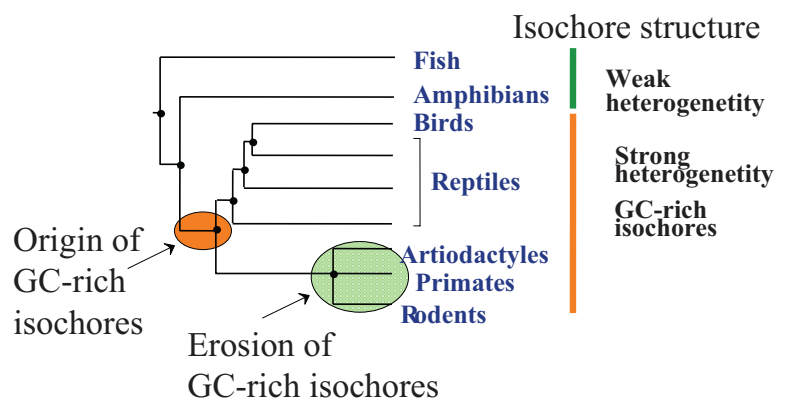


Erosion of GC-rich isochores

Equilibrium GC-content GC*



Evolution of isochores: a possible scenario



- Origin of isochores: Increase in mismatch repair bias (adaptation to CpG hypermutability)
 - => BGC in regions of high recombination (microchromosomes)
 - => Rapid increase in GC-content in microchromosomes
 - => GC-rich isochores
- Erosion of isochores:
 - Chromosome fusions => decrease in recombination rate
 - Decrease in BGC efficiency => Erosion of GC-rich isochores
 - Slow process: 1/2 time to reach equilibrium: 750 Myr

References:

Duret L, Semon M, Piganeau G, Mouchiroud D, Galtier N. Vanishing GC-rich isochores in mammalian genomes. *Genetics*. 2002 Dec;162(4):1837-47.

Marais G, Mouchiroud D, Duret L. Neutral effect of recombination on base composition in *Drosophila*. *Genet Res*. 2003 Apr;81(2):79-87.

Belle EM, Duret L, Galtier N, Eyre-Walker A. The decline of isochores in mammals: an assessment of the GC content variation along the mammalian phylogeny. *J Mol Evol*. 2004 Jun;58(6):653-60.

Meunier J, Duret L. Recombination drives the evolution of GC-content in the human genome. *Mol Biol Evol*. 2004 Jun;21(6):984-90.