



asymmetric mutagenesis drives changes from the corners (losers: Phe, Cys, Trp, Gly, Val) to the center (gainers: Pro, His, Gln, Asn, Lys, Thr) of the genetic code

2nd base

	T_L A_H	C_L G_H	A_L T_H	G_L C_H
T_L A_H	Phe TTT TTC	Ser TCT TCC	Tyr TAT TAC	Cys TGT TGC
C_L G_H	Leu TTA TTG	Pro CCT CCC	His CAT CAC	Trp TGA TGG
A_L T_H	Leu CTT CTC	Leu CTA CTG	Gln CAA CAG	Arg CGT CGC CGA CGG
G_L C_H	Ile ATT ATC	Met ATA ATG	Val GTC GTA GTG GTT	Ala ACT ACC ACA ACG GCT GCC GCA GCG
			Asn AAT AAC	Ser AGT AGC
			Lys AAA AAG	Stop AGA AGG
			Asp GAT GAC	Gly GGT GGC GGA GGG
			Glu GAA GAG	

1st base

$\log_2(\text{rate from losers to gainers} / \text{rate from gainers to losers})$

comparative species data:
from bacteria to Chordata
gainers are increasing and
losers are decreasing

