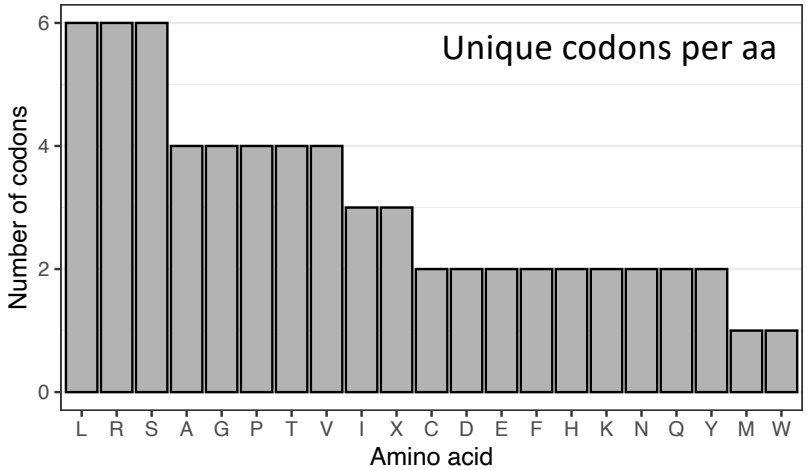
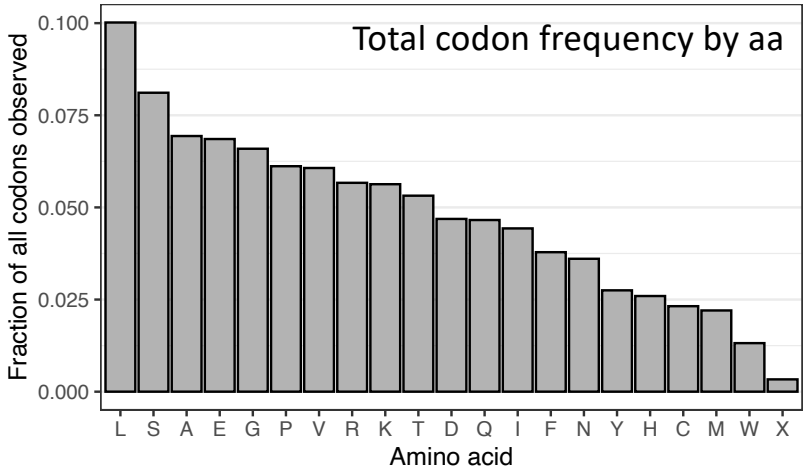
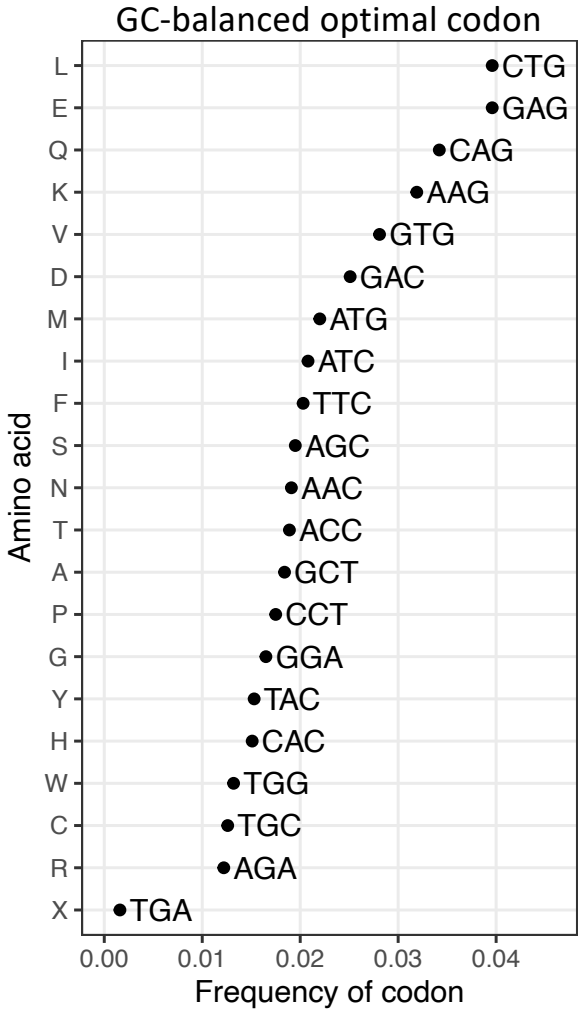

Unique codons per aa
Number of codons
0
2
4
6
L R S A G P T V I X C D E F H K N Q Y M W
Amino acid


Total codon frequency by aa
Fraction of all codons observed
0.000
0.025
0.050
0.075
0.100
L S A E G P V R K T D Q I F N Y H C M W X
Amino acid


GC-balanced optimal codon
Amino acid
L CTG
E GAG
Q CAG
K AAG
V GTG
D GAC
M ATG
I ATC
F TTC
S AGC
N AAC
T ACC
A GCT
P CCT
G GGA
Y TAC
H CAC
W TGG
C TGC
R AGA
X TGA
0.00 0.01 0.02 0.03 0.04
Frequency of codon

By position 1

TTT	F	Phe
TTC	F	Phe
TTA	L	Leu
TTG	L	Leu
TCT	S	Ser
TCC	S	Ser
TCA	S	Ser
TCG	S	Ser
TAT	Y	Tyr
TAC	Y	Tyr
TAA	X	Ter
TAG	X	Ter
TGT	C	Cys
TGC	C	Cys
TGA	X	Ter
TGG	W	Trp
CTT	L	Leu
CTC	L	Leu
CTA	L	Leu
CTG	L	Leu
CCT	P	Pro
CCC	P	Pro
CCA	P	Pro
CCG	P	Pro
CAT	H	His
CAC	H	His
CAA	Q	Gln
CAG	Q	Gln
CGT	R	Arg
CGC	R	Arg
CGA	R	Arg
CGG	R	Arg
ATT	I	Ile
ATC	I	Ile
ATA	I	Ile
ATG	M	Met
ACT	T	Thr
ACC	T	Thr
ACA	T	Thr
ACG	T	Thr
AAT	N	Asn
AAC	N	Asn
AAA	K	Lys
AAG	K	Lys
AGT	S	Ser
AGC	S	Ser
AGA	R	Arg
AGG	R	Arg
GTT	V	Val
GTC	V	Val
GTA	V	Val
GTG	V	Val
GCT	A	Ala
GCC	A	Ala
GCA	A	Ala
GCG	A	Ala
GAT	D	Asp
GAC	D	Asp
GAA	E	Glu
GAG	E	Glu
GGT	G	Gly
GGC	G	Gly
GGA	G	Gly
GGG	G	Gly

By position 2

TTT	F	Phe
TTC	F	Phe
TTA	L	Leu
TTG	L	Leu
CTT	L	Leu
CTC	L	Leu
CTA	L	Leu
CTG	L	Leu
ATT	I	Ile
ATC	I	Ile
ATA	I	Ile
ATG	M	Met
GTT	V	Val
GTC	V	Val
GTA	V	Val
GTG	V	Val
TCT	S	Ser
TCC	S	Ser
TCA	S	Ser
TCG	S	Ser
CCT	P	Pro
CCC	P	Pro
CCA	P	Pro
CCG	P	Pro
ACT	T	Thr
ACC	T	Thr
ACA	T	Thr
ACG	T	Thr
GCT	A	Ala
GCC	A	Ala
GCA	A	Ala
GCG	A	Ala
TAT	Y	Tyr
TAC	Y	Tyr
TAA	X	Ter
TAG	X	Ter
CAT	H	His
CAC	H	His
CAA	Q	Gln
CAG	Q	Gln
AAT	N	Asn
AAC	N	Asn
AAA	K	Lys
AAG	K	Lys
GAT	D	Asp
GAC	D	Asp
GAA	E	Glu
GAG	E	Glu
TGT	C	Cys
TGC	C	Cys
TGA	X	Ter
TGG	W	Trp
CGT	R	Arg
CGC	R	Arg
CGA	R	Arg
CGG	R	Arg
AGT	S	Ser
AGC	S	Ser
AGA	R	Arg
AGG	R	Arg
GGT	G	Gly
GGC	G	Gly
GGA	G	Gly
GGG	G	Gly