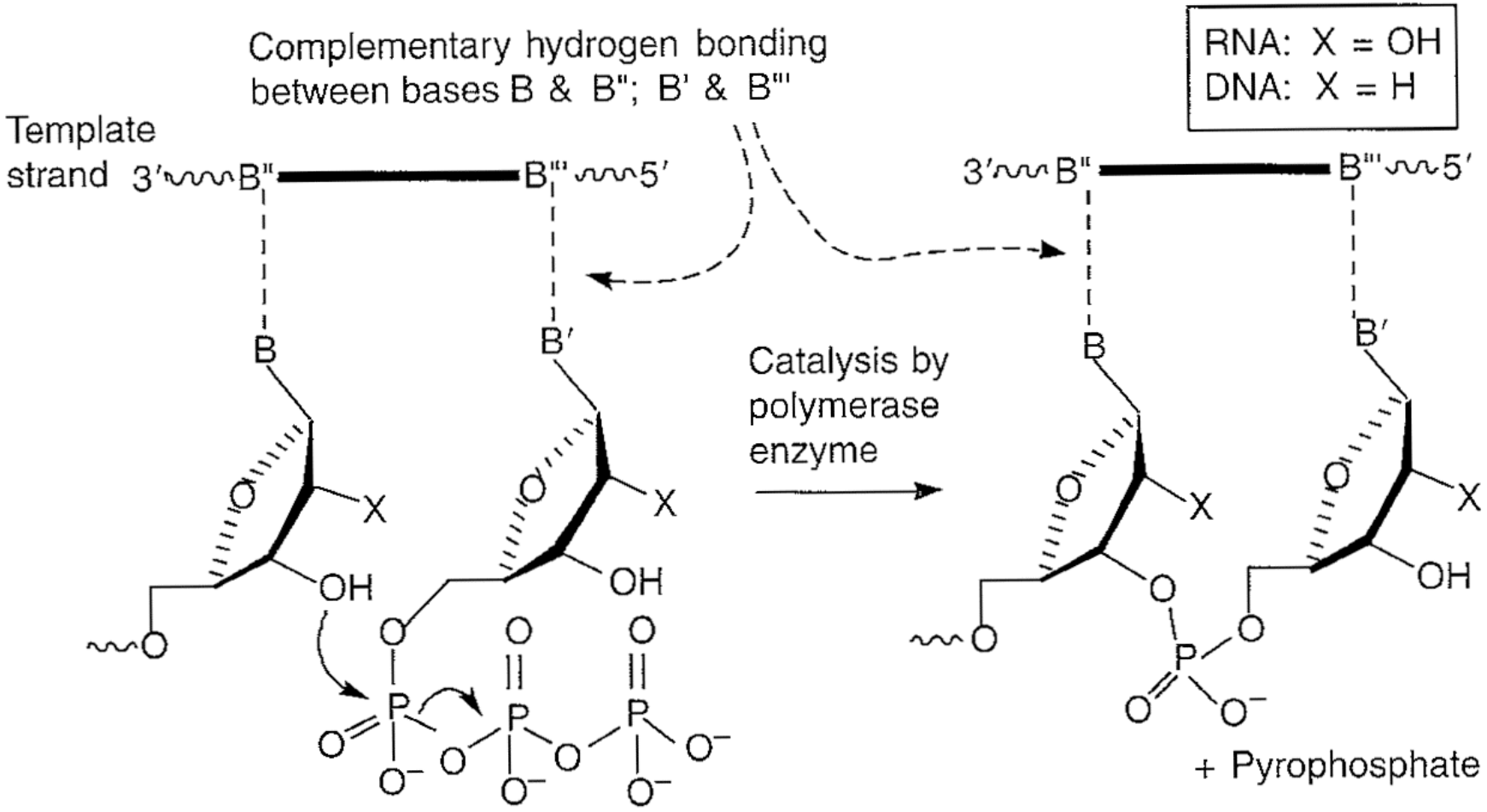
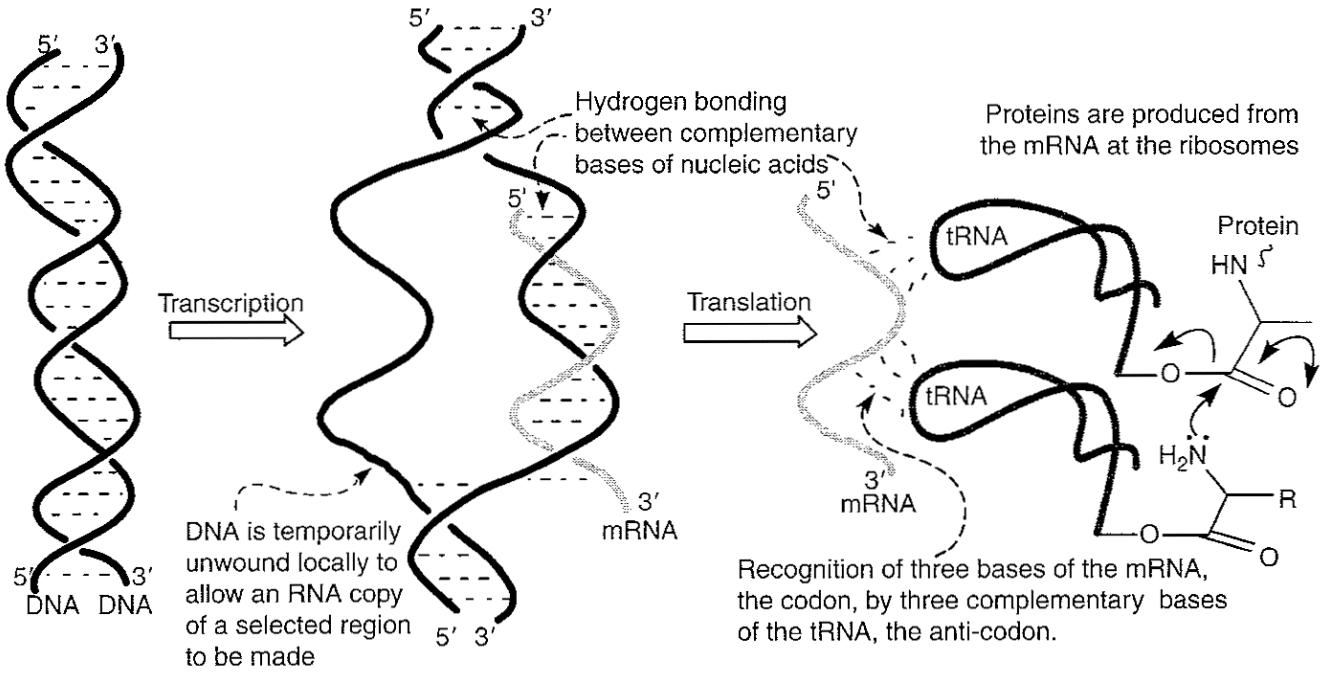
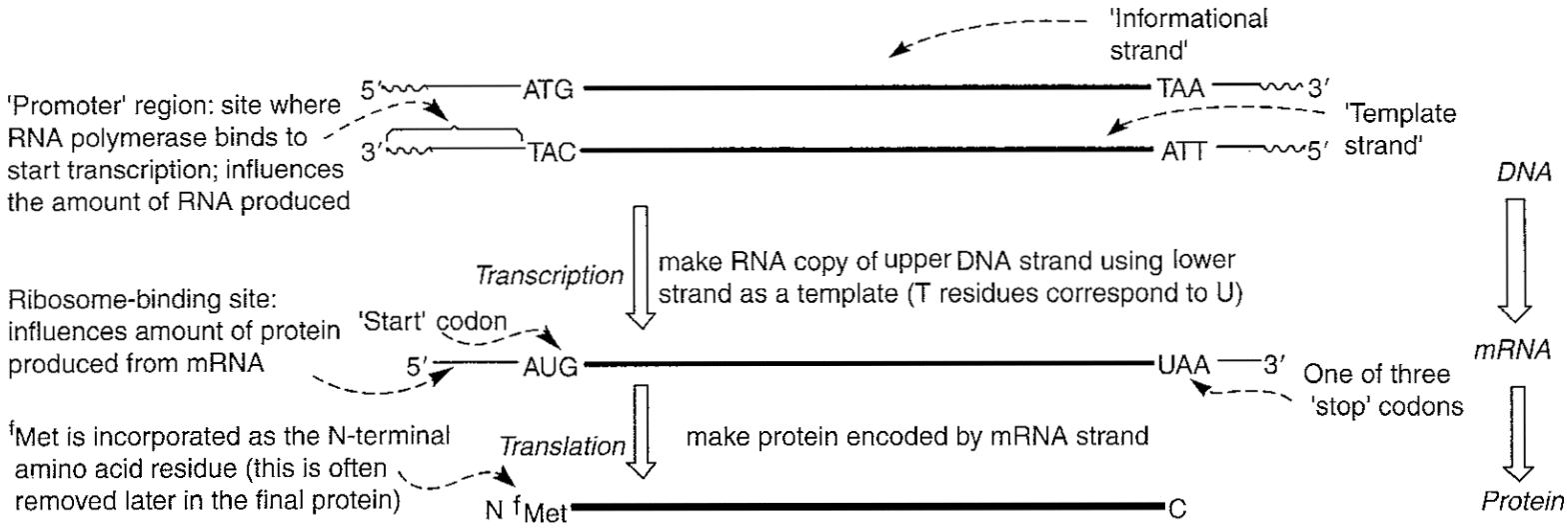

Complementary hydrogen bonding
between bases B & B"; B' & B"'
RNA: X = OH
DNA: X = H
Template
strand
3'
B"
B"'
5'
B
B'
X
OH
O
P
O⁻
Catalysis by
polymerase
enzyme
+ Pyrophosphate


5′ 3′
5′ 3′
DNA DNA
Transcription
5′ 3′
Hydrogen bonding
between complementary
bases of nucleic acids
5′
3′
mRNA
DNA is temporarily
unwound locally to
allow an RNA copy
of a selected region
to be made
5′ 3′
Translation
Proteins are produced from
the mRNA at the ribosomes
5′
tRNA
tRNA
3′
mRNA
Protein
HN
O
O
H_2N
R
O
O
Recognition of three bases of the mRNA,
the codon, by three complementary bases
of the tRNA, the anti-codon.

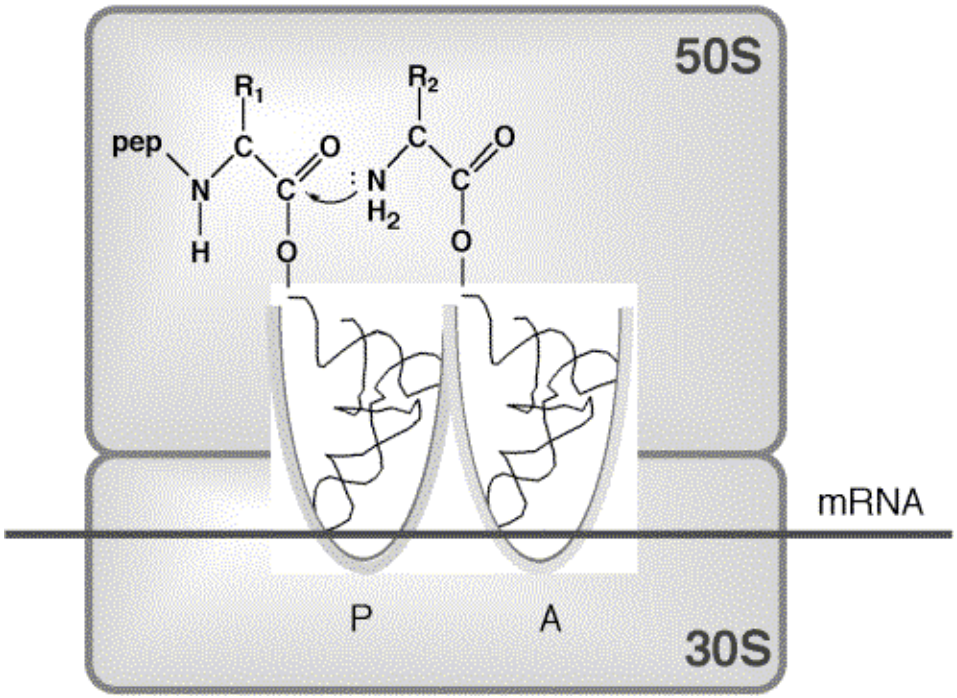

'Informational
strand'
'Promoter' region: site where
RNA polymerase binds to
start transcription; influences
the amount of RNA produced
5′
ATG
TAA
3′
3′
TAC
ATT
5′
'Template
strand'
DNA
Transcription
make RNA copy of upper DNA strand using lower
strand as a template (T residues correspond to U)
Ribosome-binding site:
influences amount of protein
produced from mRNA
'Start' codon
5′
AUG
UAA
3′
One of three
'stop' codons
mRNA
fMet is incorporated as the N-terminal
amino acid residue (this is often
removed later in the final protein)
Translation
make protein encoded by mRNA strand
N fMet
C
Protein

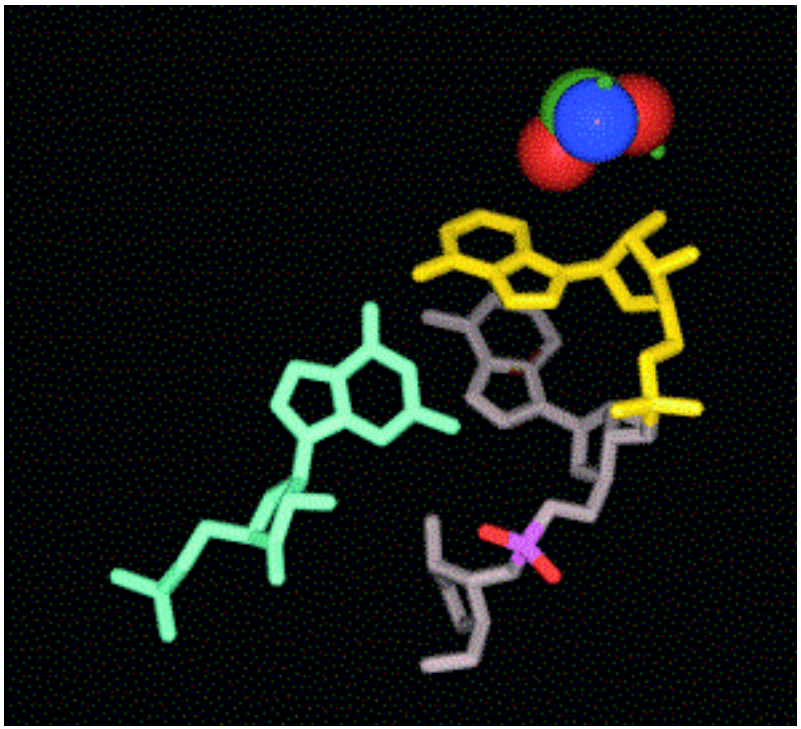
The genetic code Remember **U** in mRNA and **T** in DNA

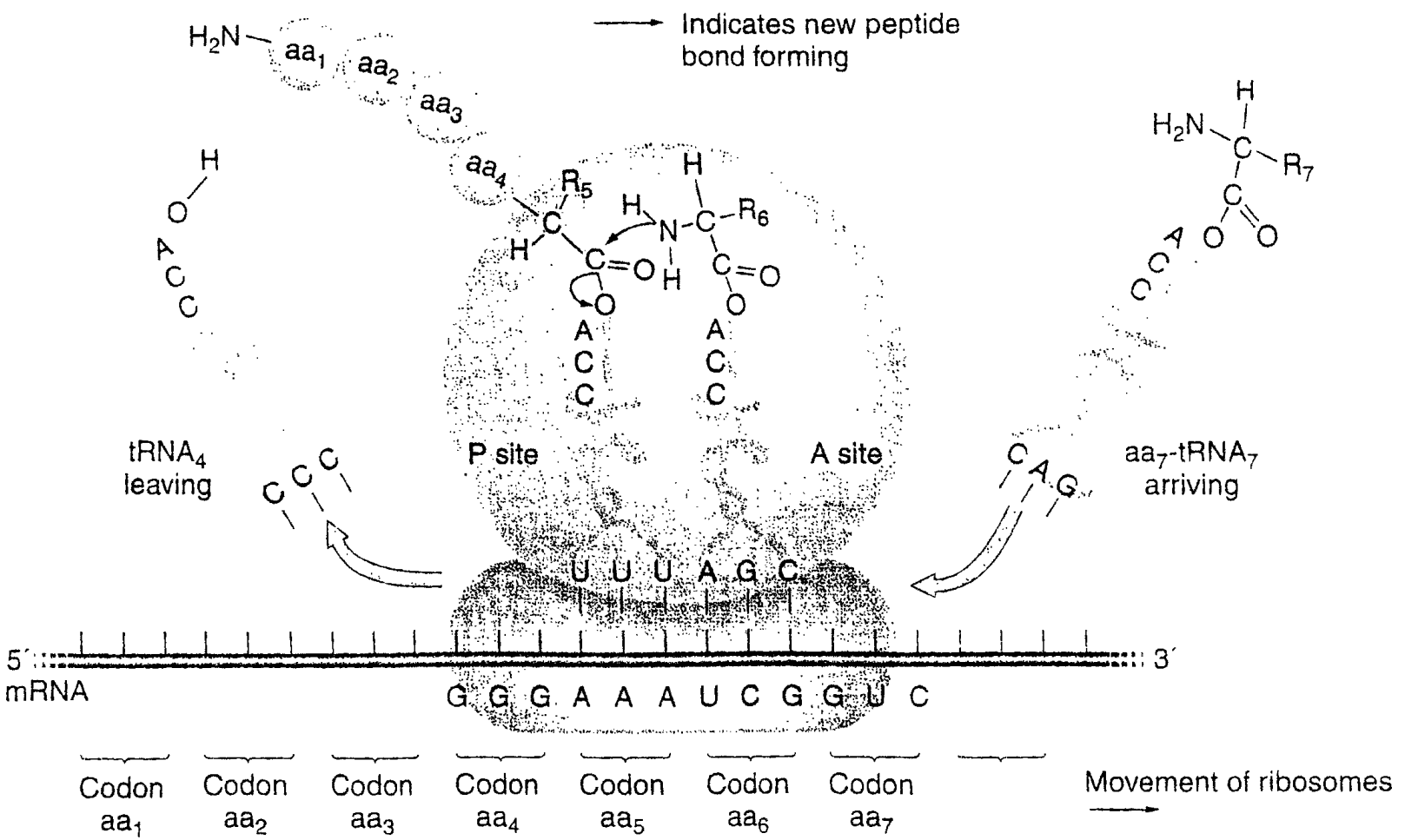
5′ base	Middle base				3′ base
	U	**C**	**A**	**G**	
U	UUU Phe	UCU Ser	UAU Tyr	UGU Cys	**U**
	UUC Phe	UCC Ser	UAC Tyr	UGC Cys	**C**
	UUA Leu	UCA Ser	UAA Stop*	UGA Stop*	**A**
	UUG Leu	UCG Ser	UAG Stop*	UGG Trp	**G**
C	CUU Leu	CCU Pro	CAU His	CGU Arg	**U**
	CUC Leu	CCC Pro	CAC His	CGC Arg	**C**
	CUA Leu	CCA Pro	CAA Gln	CGA Arg	**A**
	CUG Leu	CCG Pro	CAG Gln	CGG Arg	**G**
A	AUU Ile	ACU Thr	AAU Asn	AGU Ser	**U**
	AUC Ile	ACC Thr	AAC Asn	AGC Ser	**C**
	AUA Ile	ACA Thr	AAA Lys	AGA Arg	**A**
	AUG Met†	ACG Thr	AAG Lys	AGG Arg	**G**
G	GUU Val	GCU Ala	GAU Asp	GGU Gly	**U**
	GUC Val	GCC Ala	GAC Asp	GGC Gly	**C**
	GUA Val	GCA Ala	GAA Glu	GGA Gly	**A**
	GUG Val	GCG Ala	GAG Glu	GGG Gly	**G**

*Stop codons have no amino acids assigned to them.

†The AUG codon is the usual initiation codon as well as that for methionine residues elsewhere. The code is almost universal but differences have been found in mitochondrial DNA from some organisms

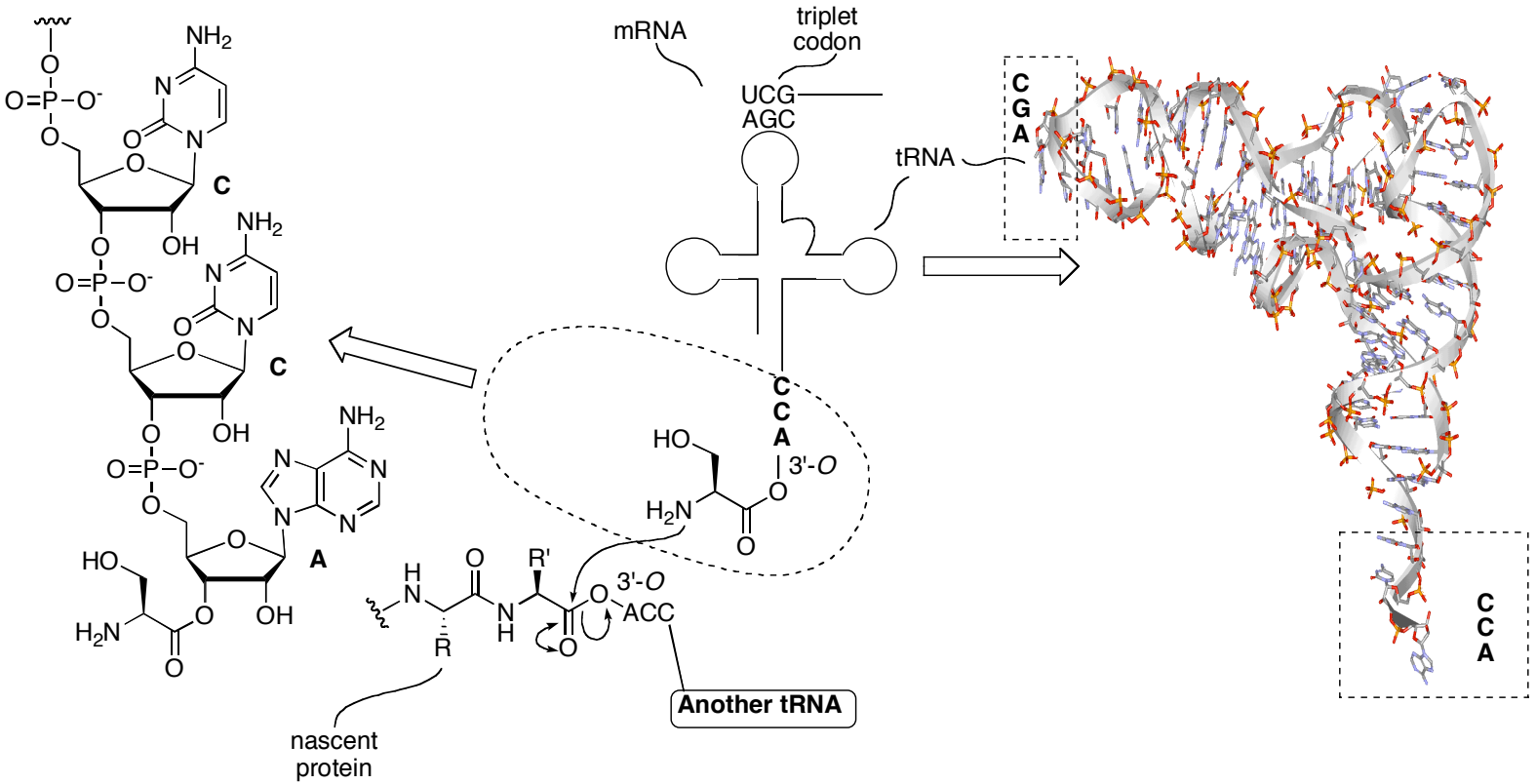

50S
pep
R1
R2
C
O
N
H
H2
mRNA
P
A
30S

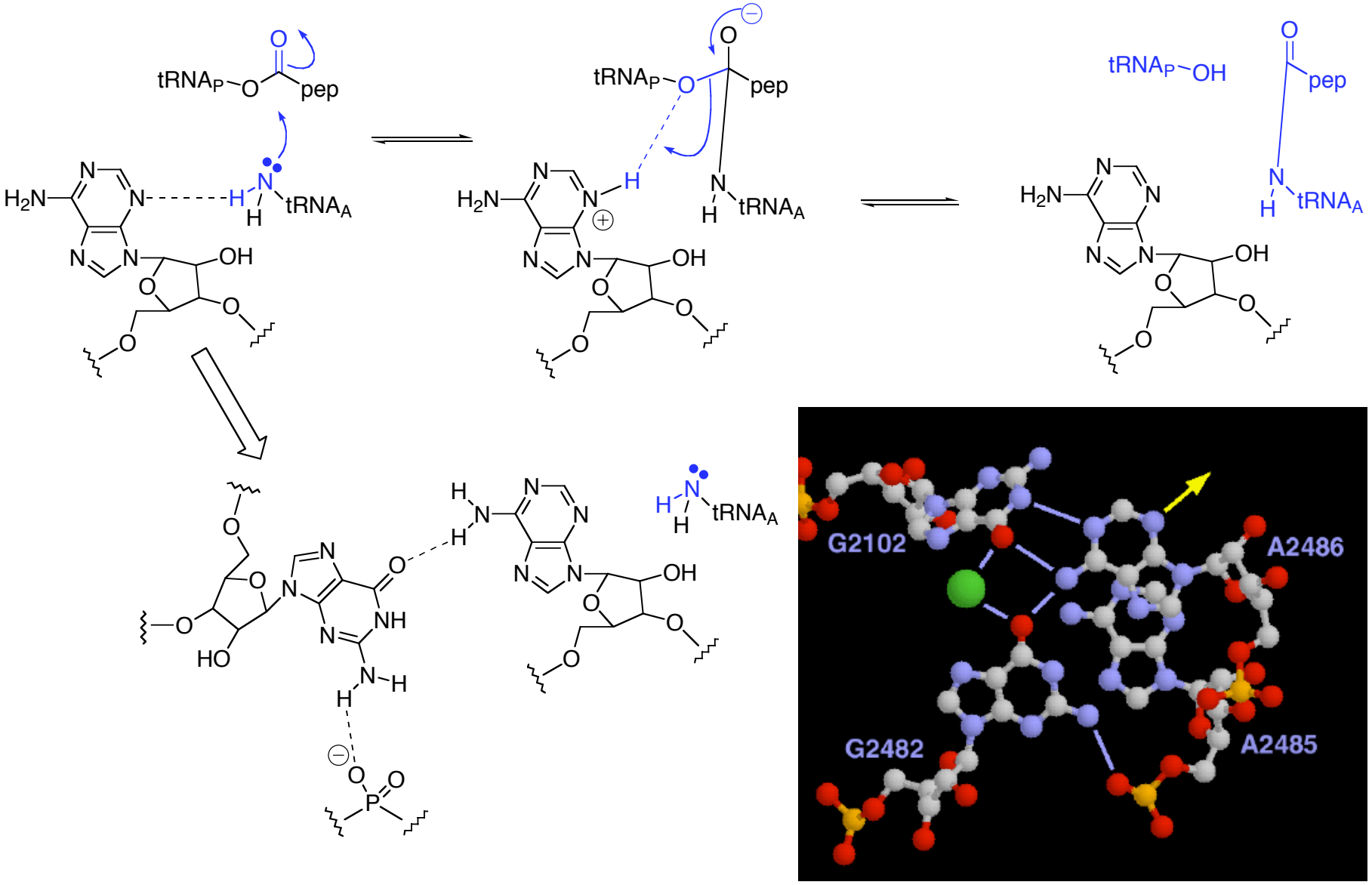


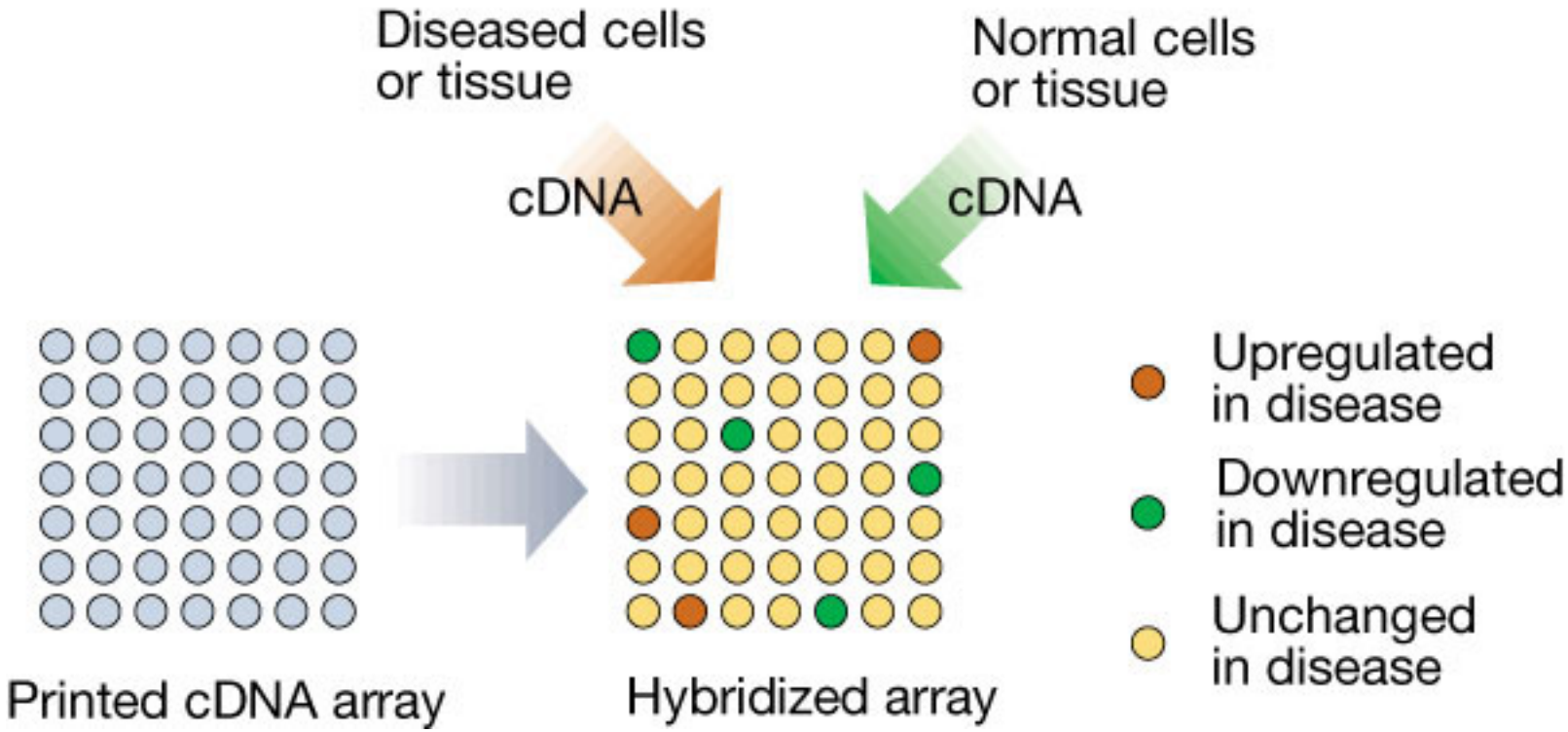


.....|UUU|UUA|GGG|AAA|UCG|GUC| .....
..... Phe Leu Gly Lys Ser Val

.....|UUU|UUA|GGG|AAA|U**GC**|GUC| .....
..... Phe Leu Gly Lys **Cys** Val

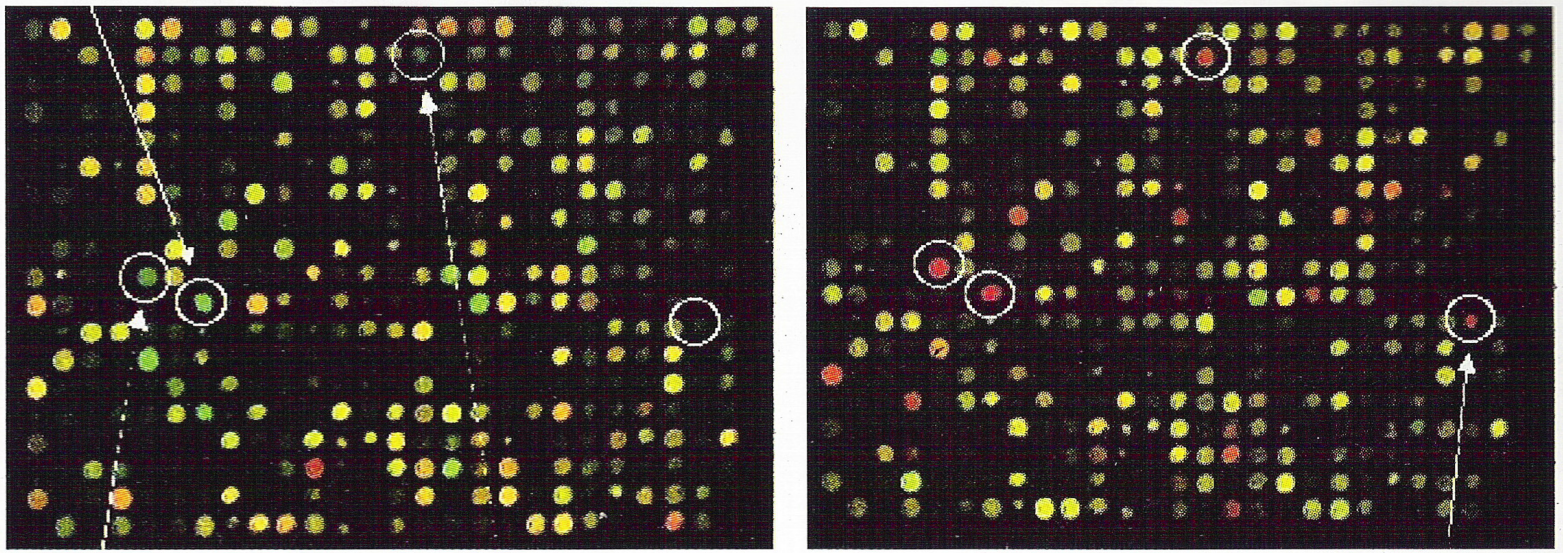

mRNA
triplet codon
UCG
AGC
tRNA
C
G
A
C
C
A
3'-O
HO
H2N
O
C
C
A
3'-O
ACC
Another tRNA
nascent protein
R
R'
H
N
O
NH2
OH
HO
H2N
A
C
C
A


tRNAP
O
pep
H2N
N
H
tRNAA
OH
HO
NH
P
tRNAP–OH
G2102
A2486
G2482
A2485


Diseased cells
or tissue
Normal cells
or tissue
cDNA
cDNA
Printed cDNA array
Hybridized array
Upregulated
in disease
Downregulated
in disease
Unchanged
in disease

Lysyl oxidase uninfected

8 wk post infected



Collagen binding protein Procollagen, type III, alpha 2

Procollagen, type V, alpha 2