

Vorlesung

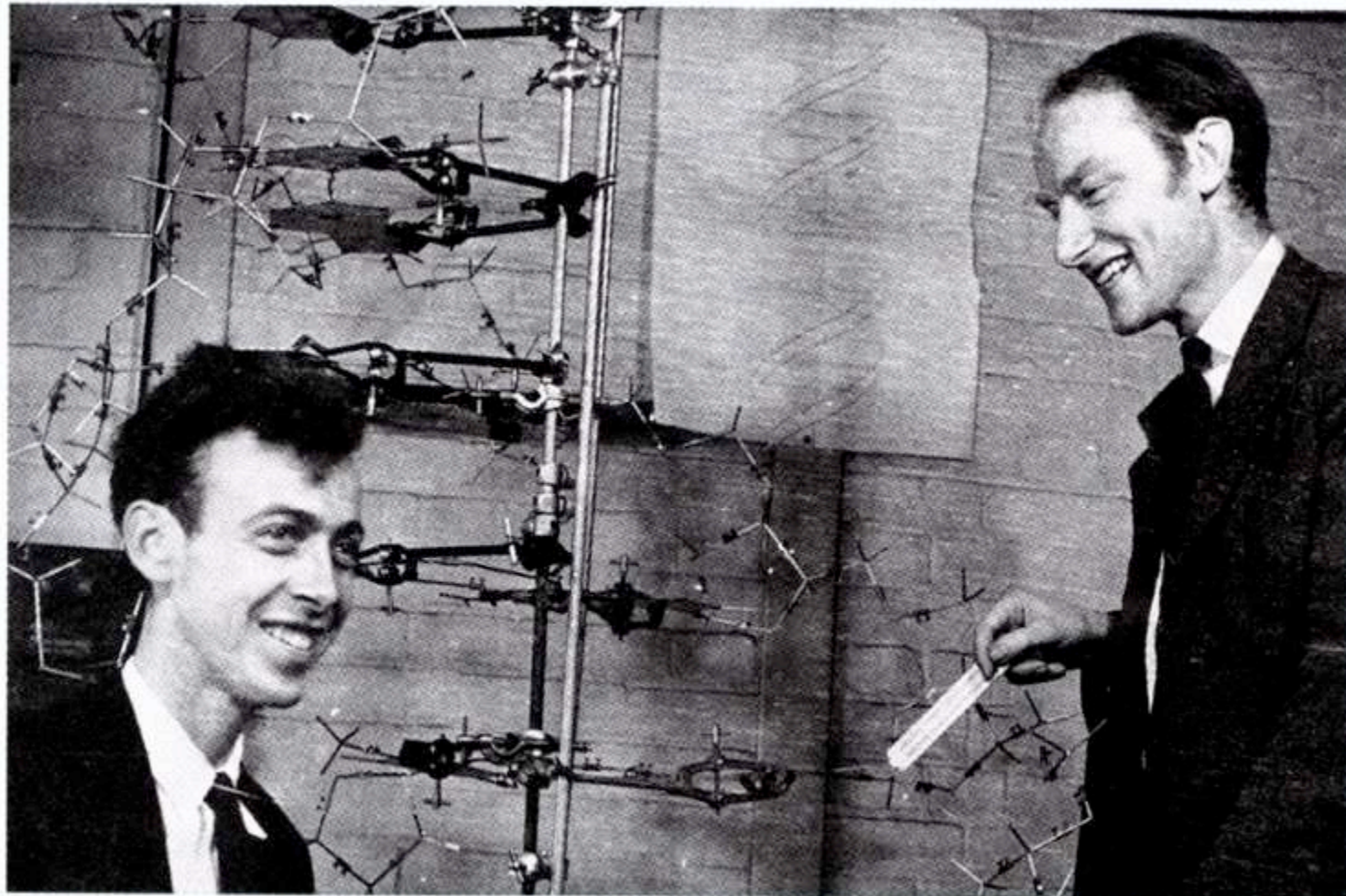
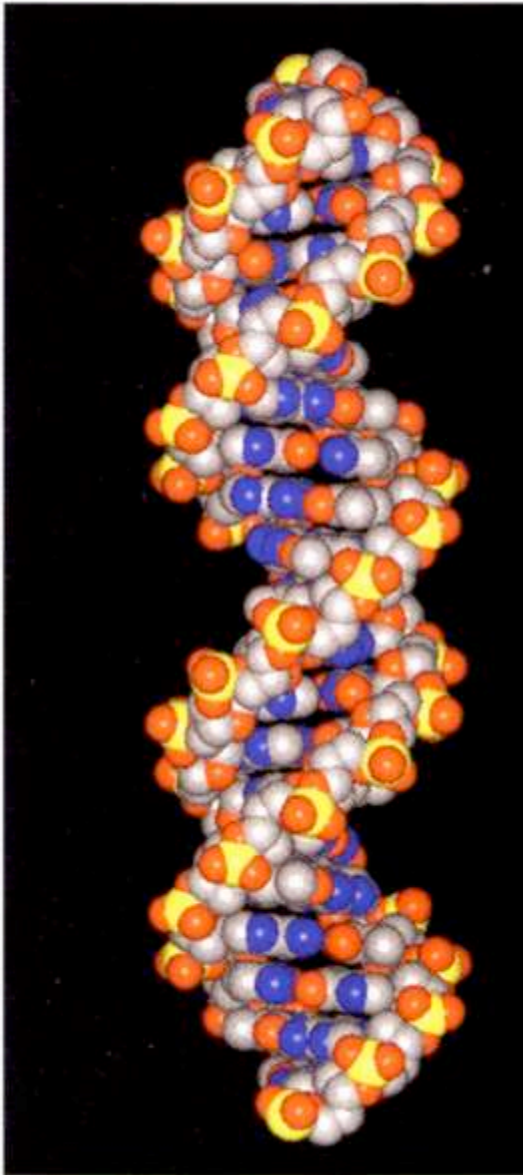
„Zellbiologie für Bioinformatiker“

***„Die DNA Doppelhelix
und ihre Transkription“***

A. Nordheim

Mittwoch, 12. 05. 2003

Die DNA Doppelhelix: 1953 - 2003

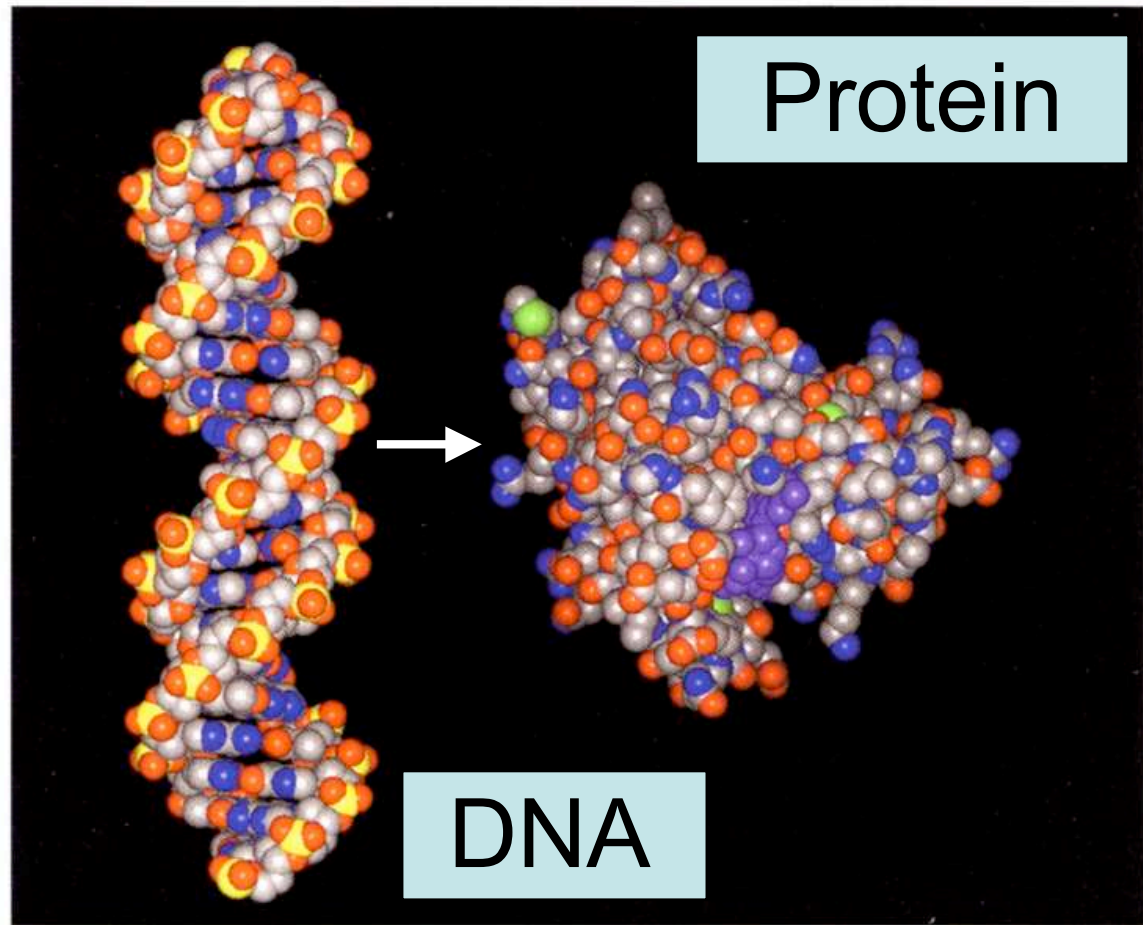


James Watson and Francis Crick with their DNA model.
(Camera Press.)

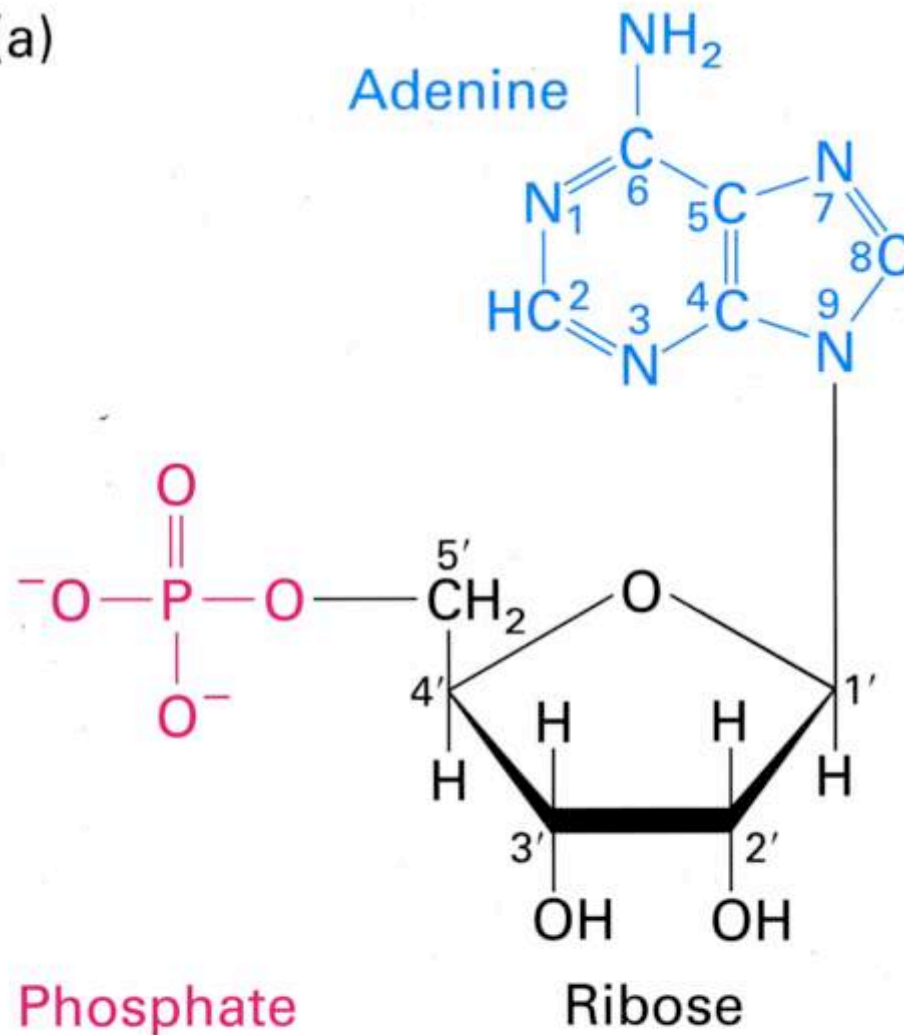
Gene (DNA)
kodieren
Proteine

Das **Alphabet**
der DNA:
4 Buchstaben
(A, G, C, T)

Das **Alphabet** der Proteine:
20 Buchstaben (= 20 Aminosäuren)

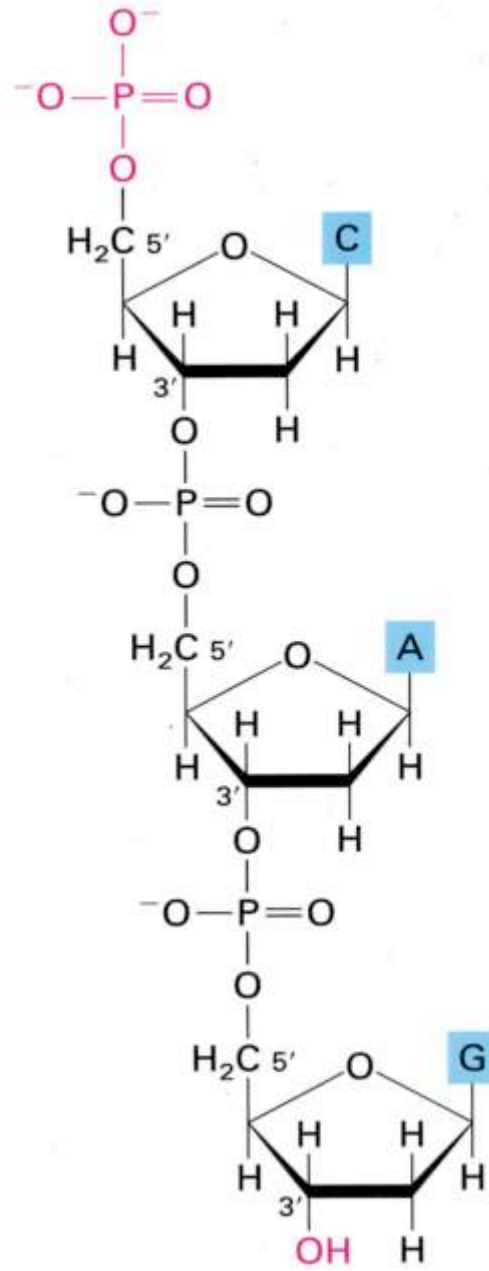


(a)



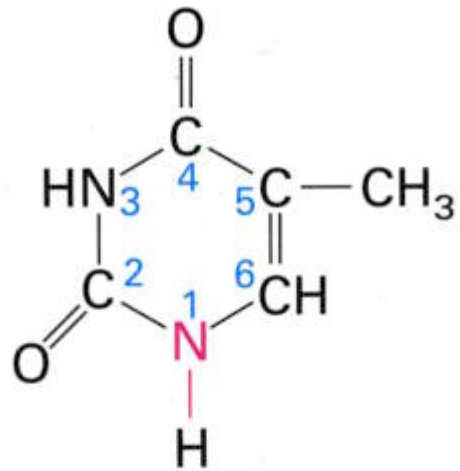
**Adenosine
5'-monophosphate
(AMP)**

5' end



3' end

Pyrimidine

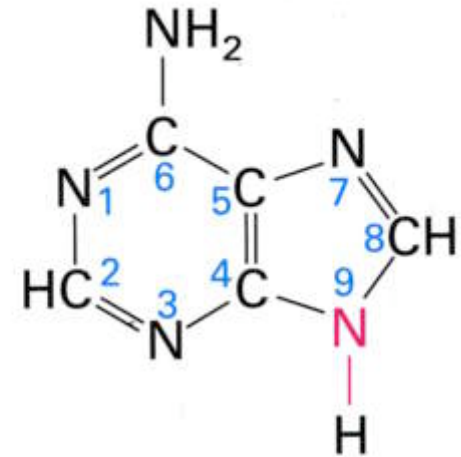


Thymine (T)

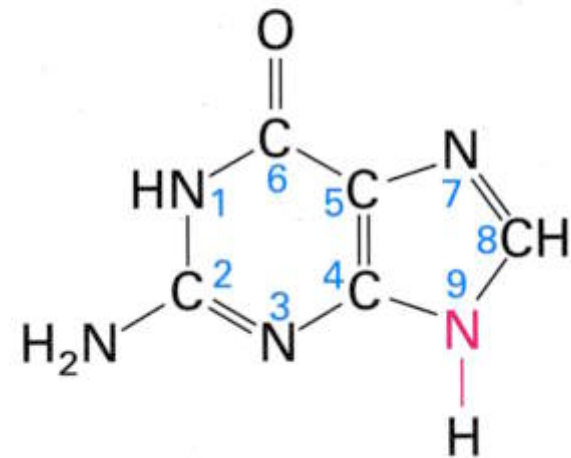


Cytosine (C)

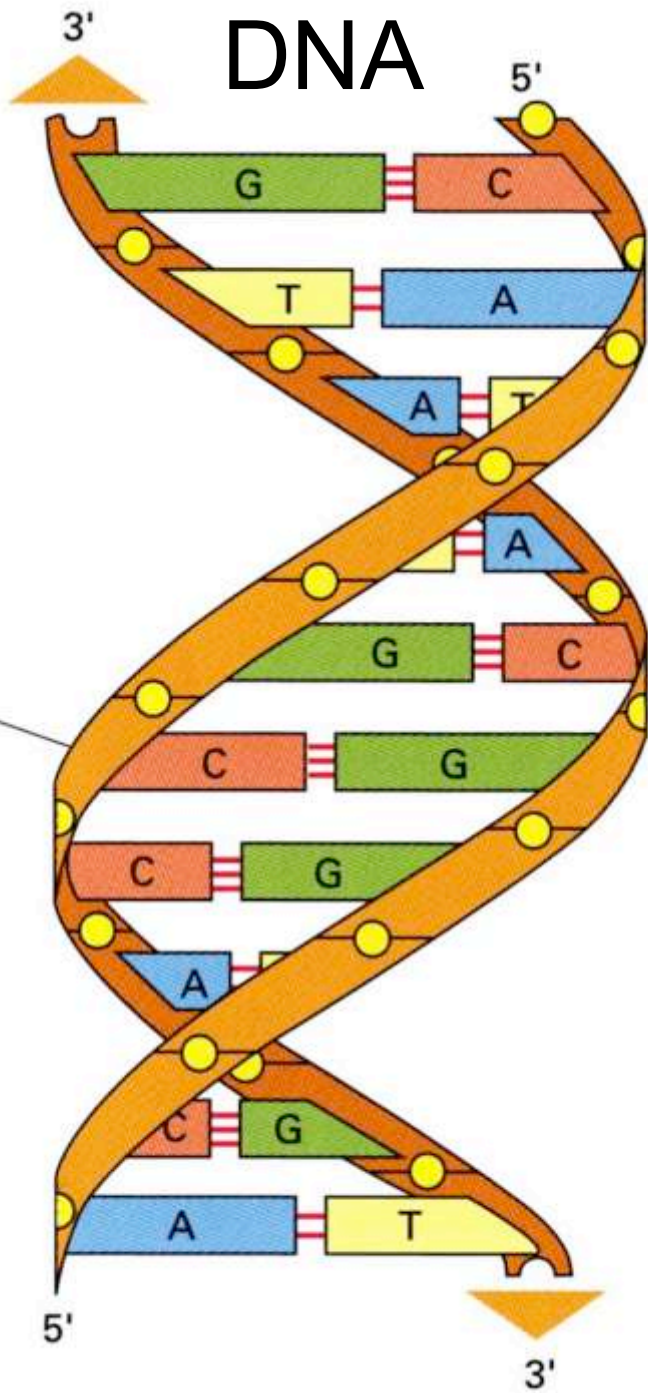
Purine



Adenine (A)



Guanine (G)



mRNA

3'

U

A

A

C

G

G

U

C

A

5'

Protein

C

Asn

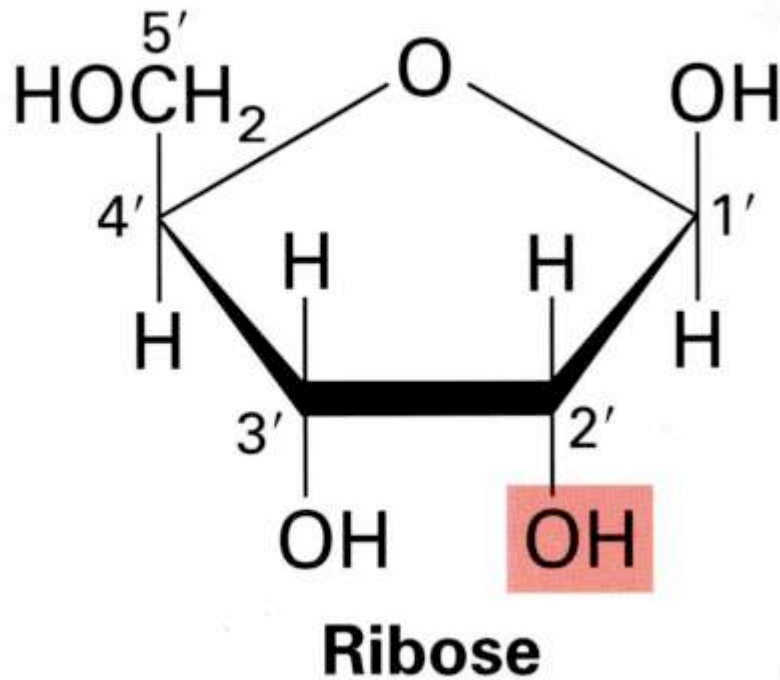
Gly

Thr

N

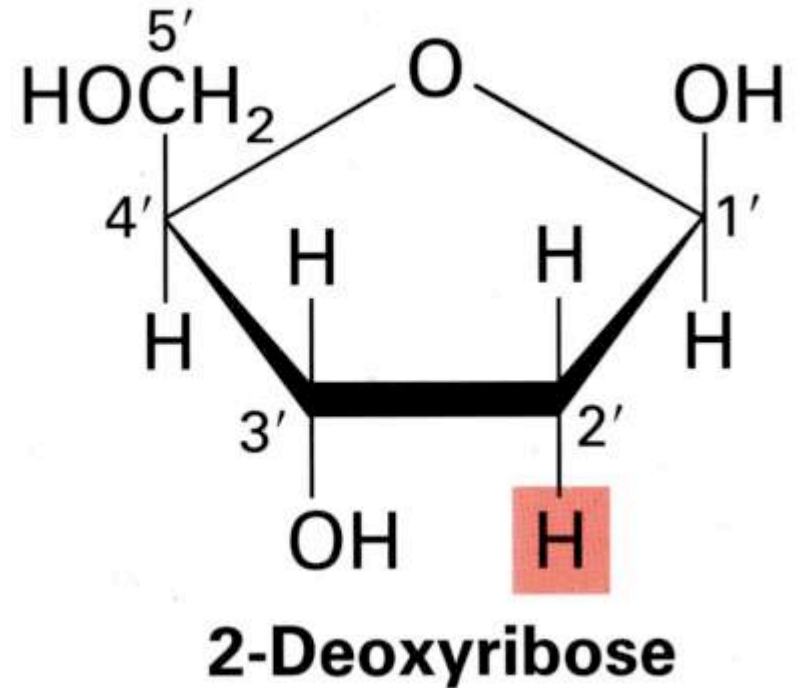
Der
geneti-
sche
Code

Unterschied zwischen RNA und DNA



↓

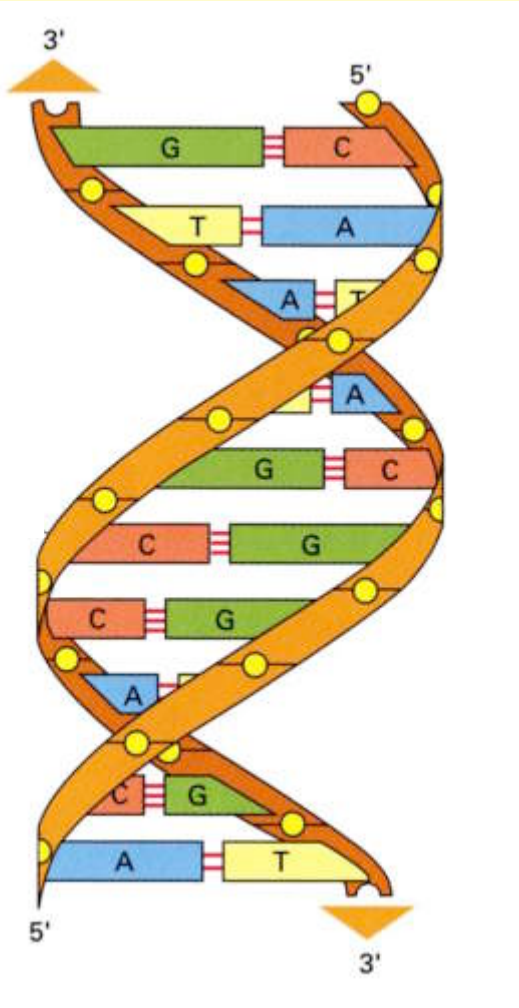
RNA



↓

DNA

DNA



mRNA

3'

U
A
A
C
G
G
U
C
A

5'

Tran-
skription

Trans-
lation

Protein

C

Asn

Gly

Thr

N

Warum (mindestens) ein Triplet-Code?

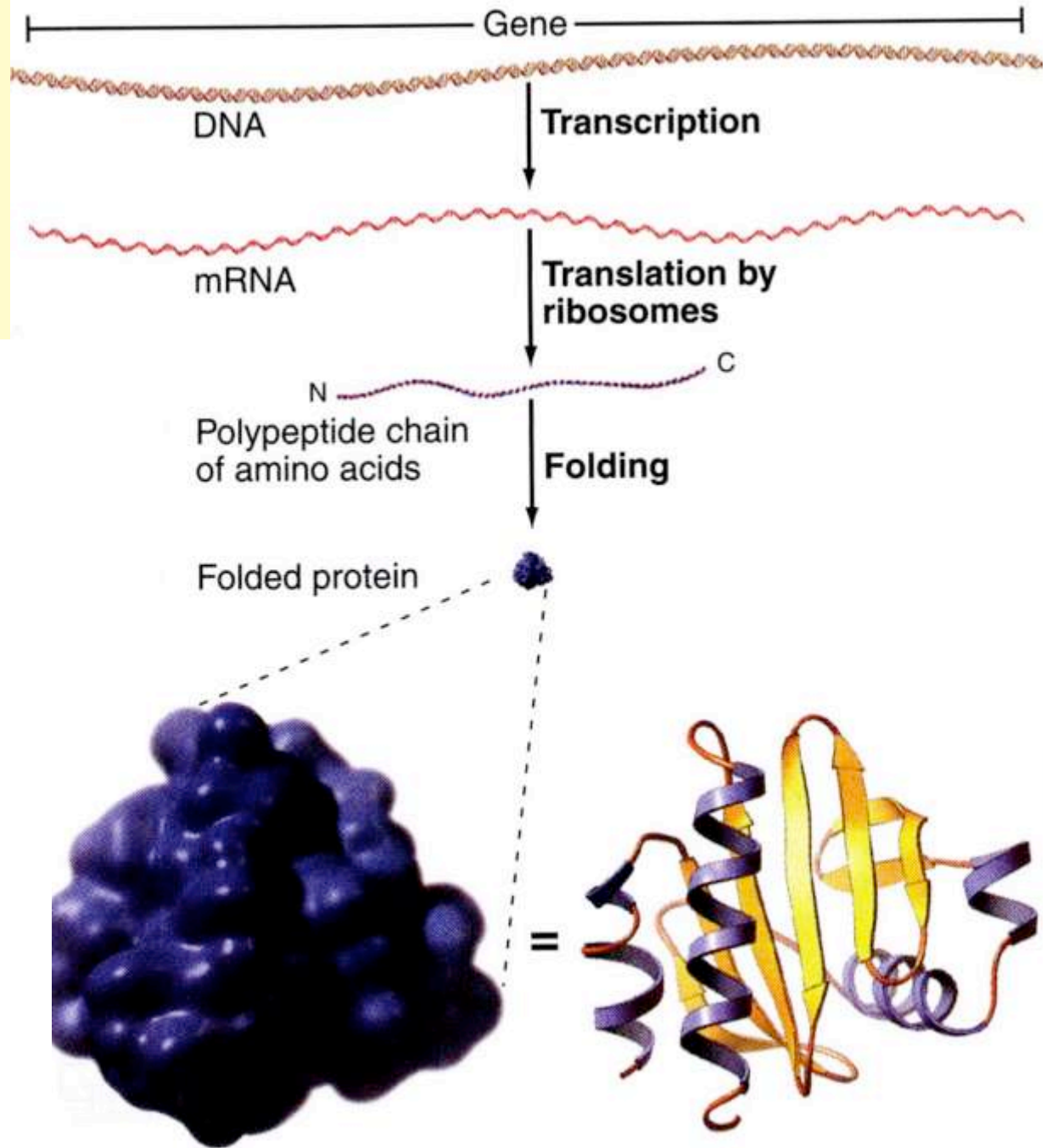
20 Aminosäuren (AS),
4 verschiedene Basen

1 Base / 1 AS	4^1	=	4
2 Basen / 1 AS	4^2	=	16
3 Basen / 1 AS	4^3	=	64

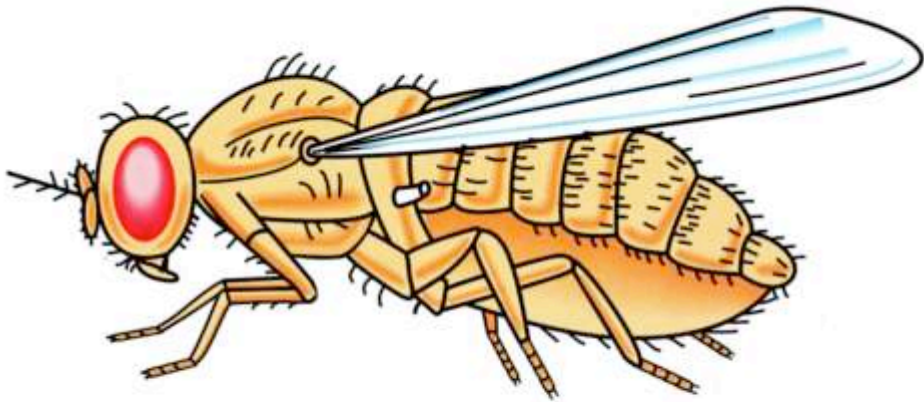
Triplet-Code: 3 Basen sind Codon,
61 AS Codons, 3 STOP Codons
1 Start Codon (AUG, Met)

(F. Crick & S. Brenner >>1960; M. Nirenberg / H. G. Khorana, 1965)

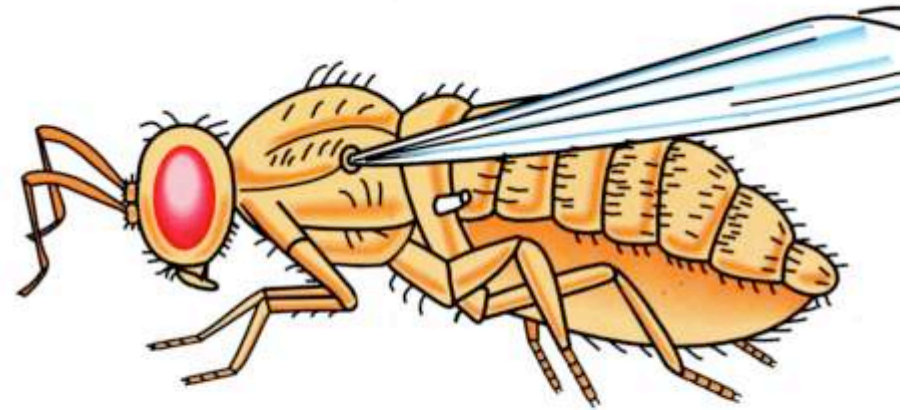
Übertragung genetischer Information in die Synthese von Proteinen



Exakte Genregulation ist essentiell.



Normale Fliege



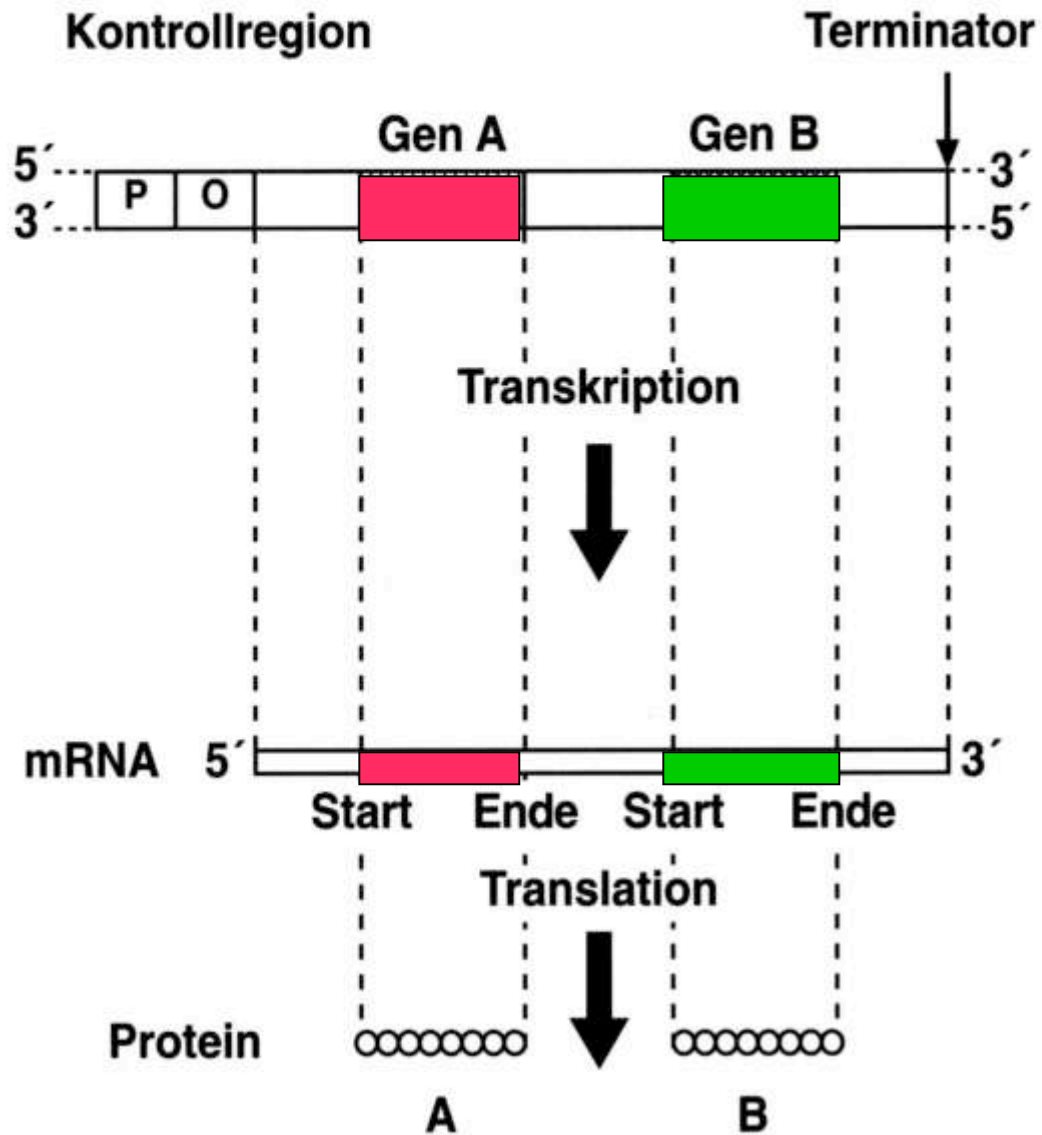
Antennapedia
Mutante

Definition eines Gens:

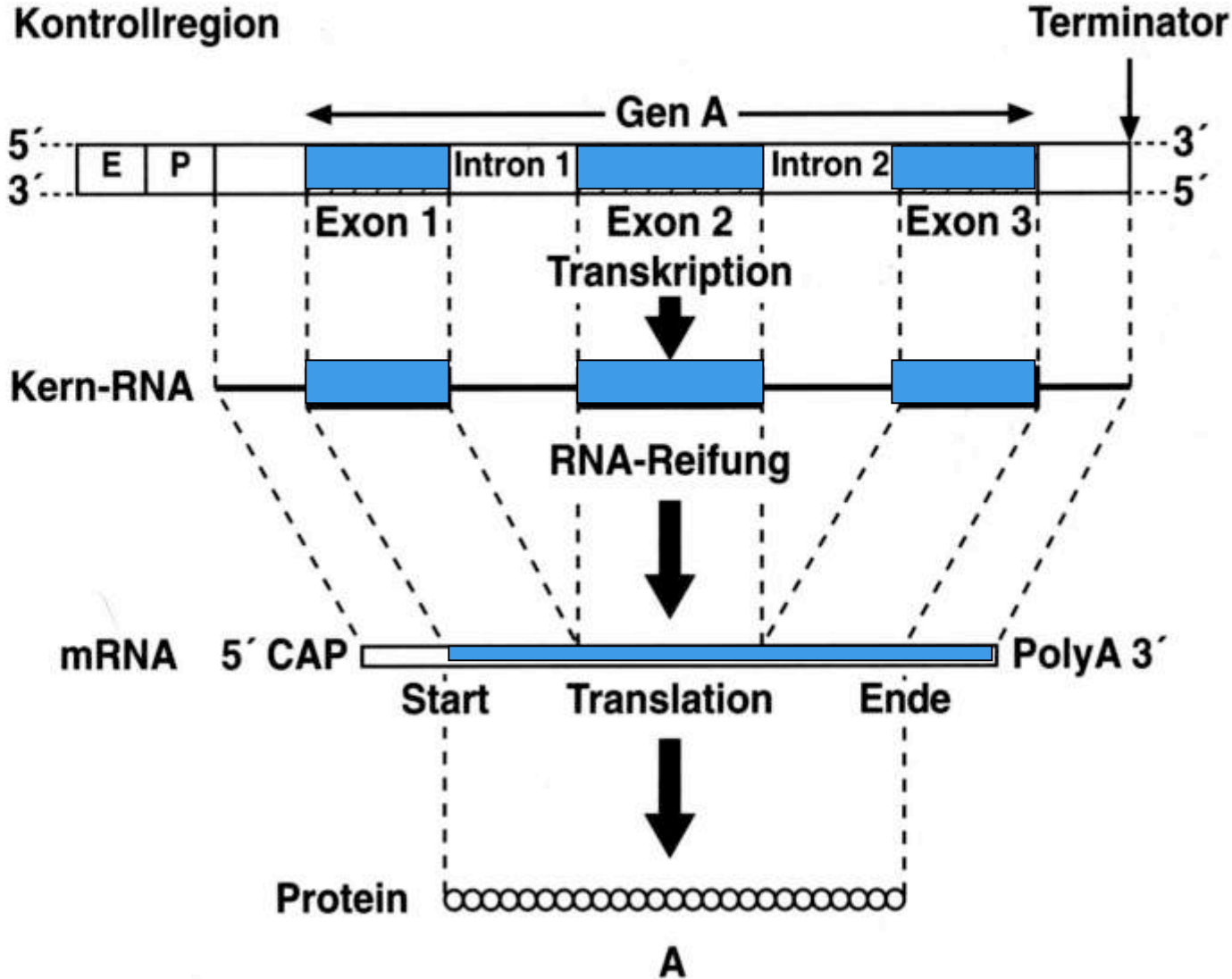
Die gesamte Nukleinsäuresequenz,
die zur Synthese eines funktionellen
Proteins oder RNA-Moleküls
notwendig ist.

(d. h.: kodierende und regulatorische Information)

Prokaryonten

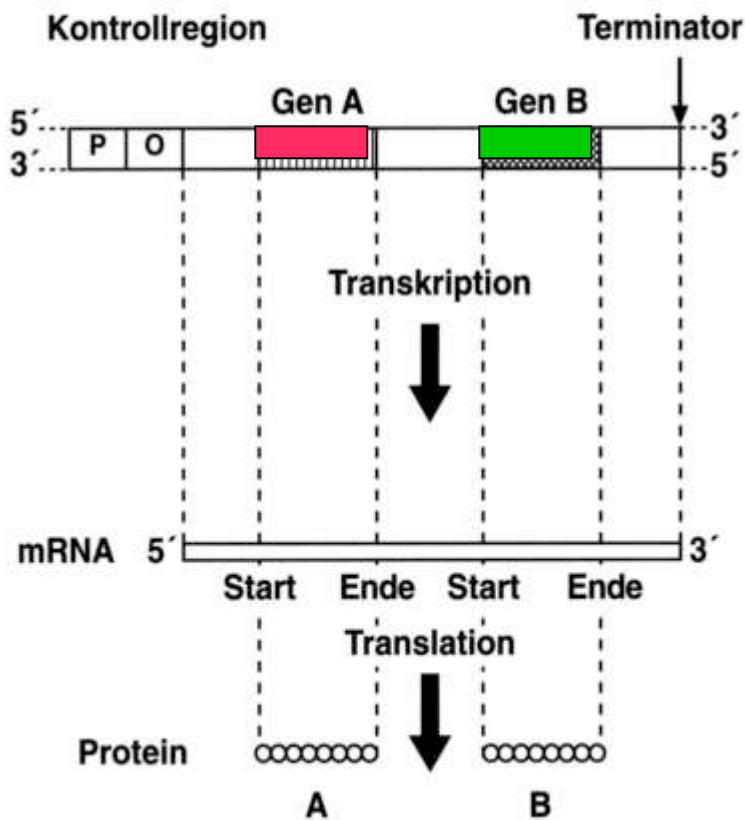


Eukaryonten

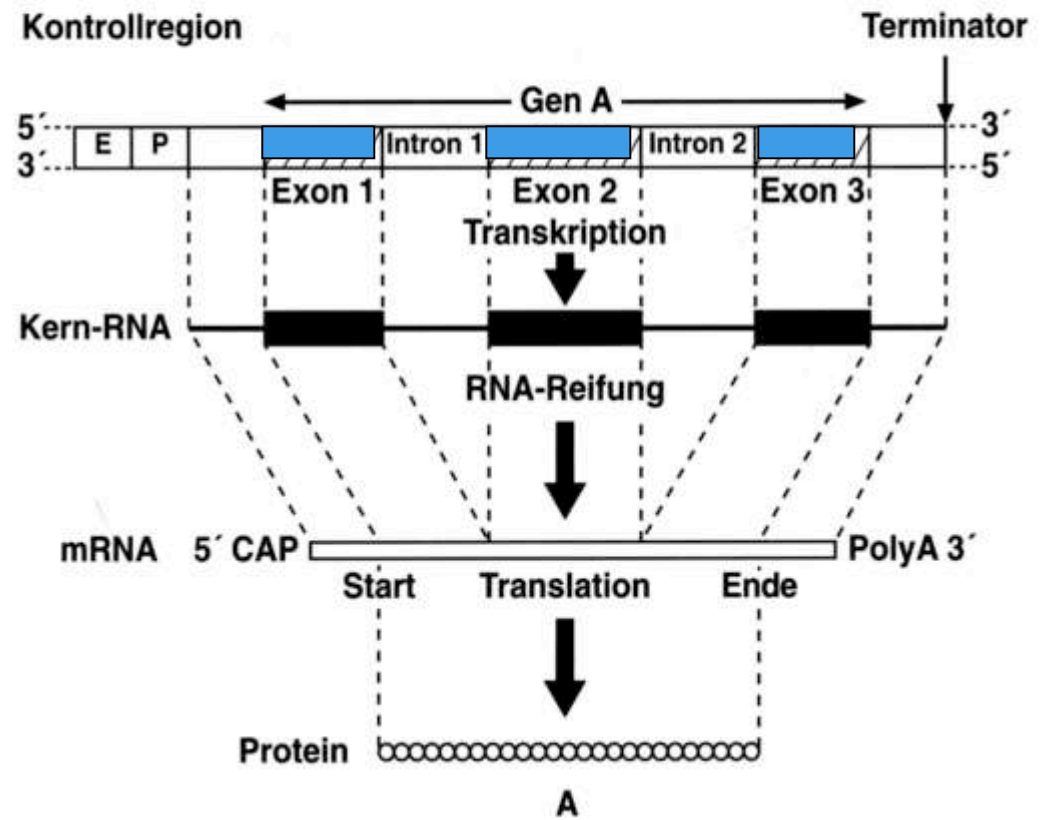


Vergleich der Genexpression bei Prokaryonten und Eukaryonten

Prokaryonten



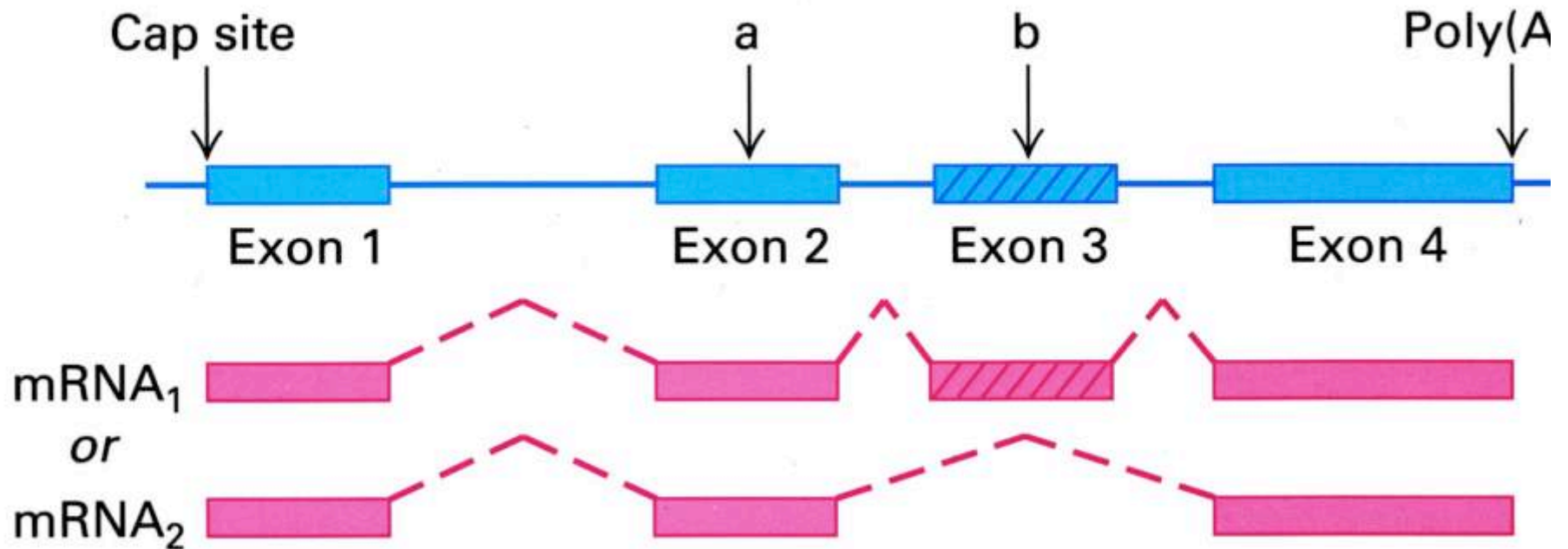
Eukaryonten



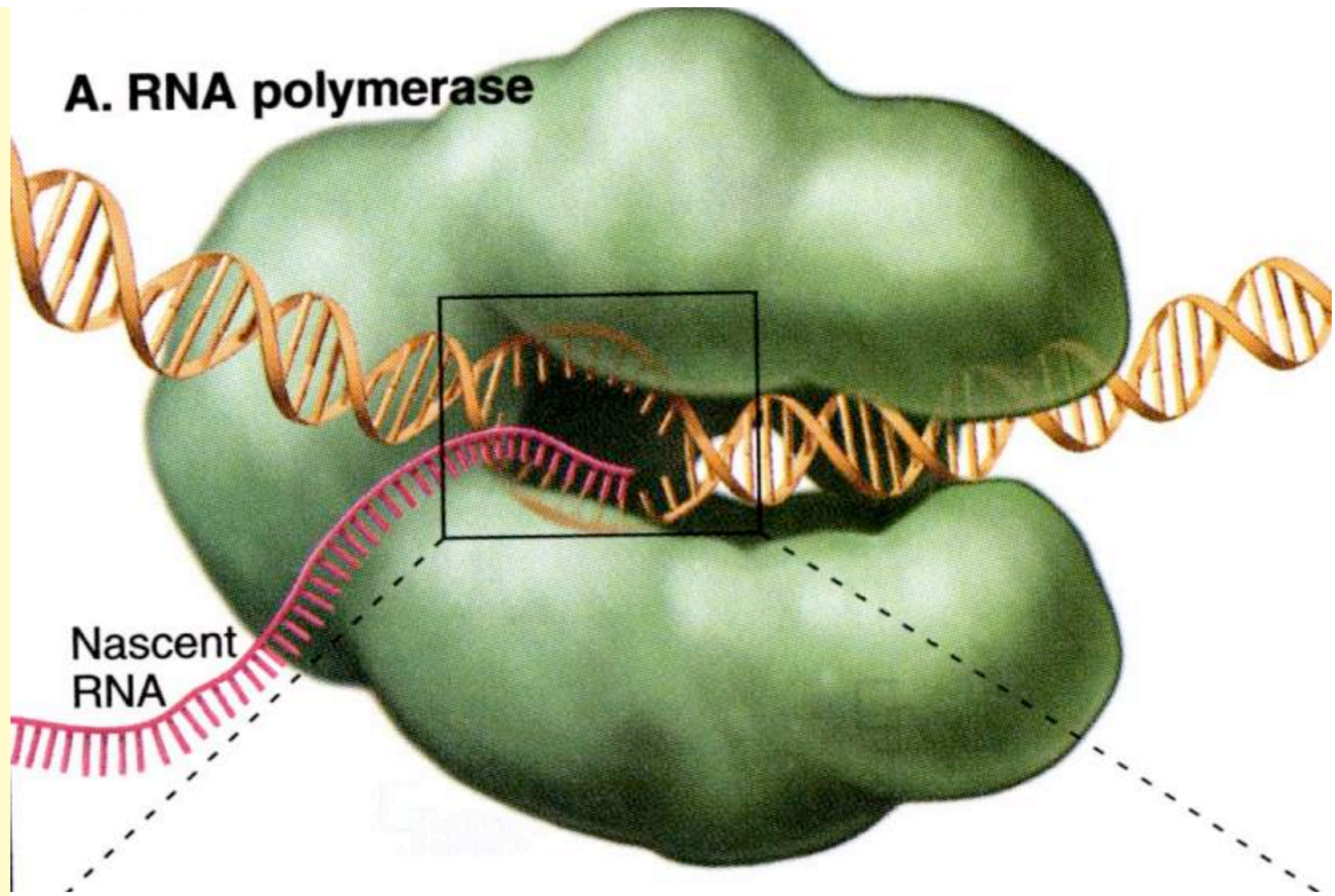
Reifung der mRNA:

- Capping 5' Ende,
- Poly-Adenylierung, 3'
- Splicing
- alternat. Splicing

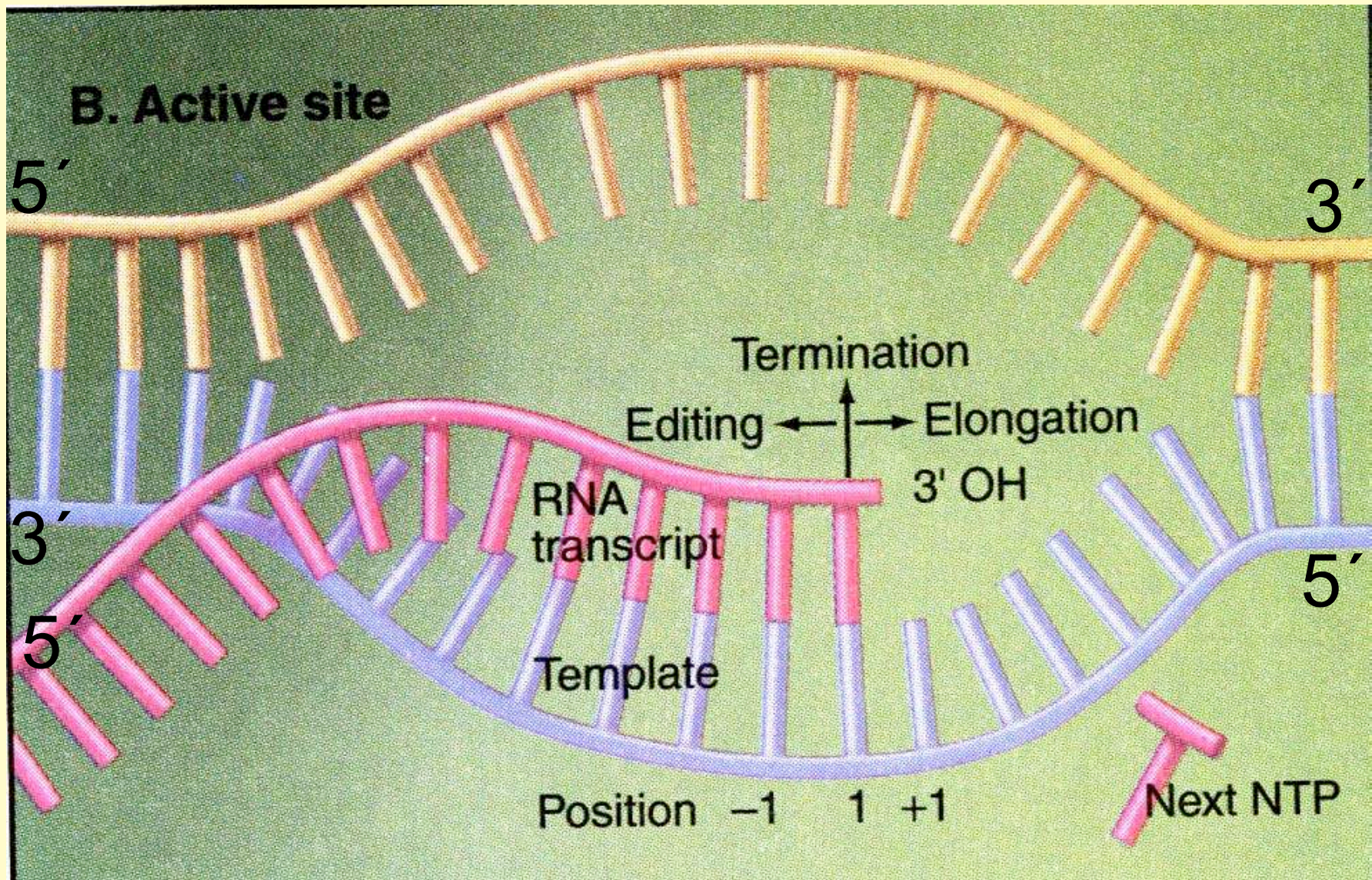
(b) Alternative internal exons



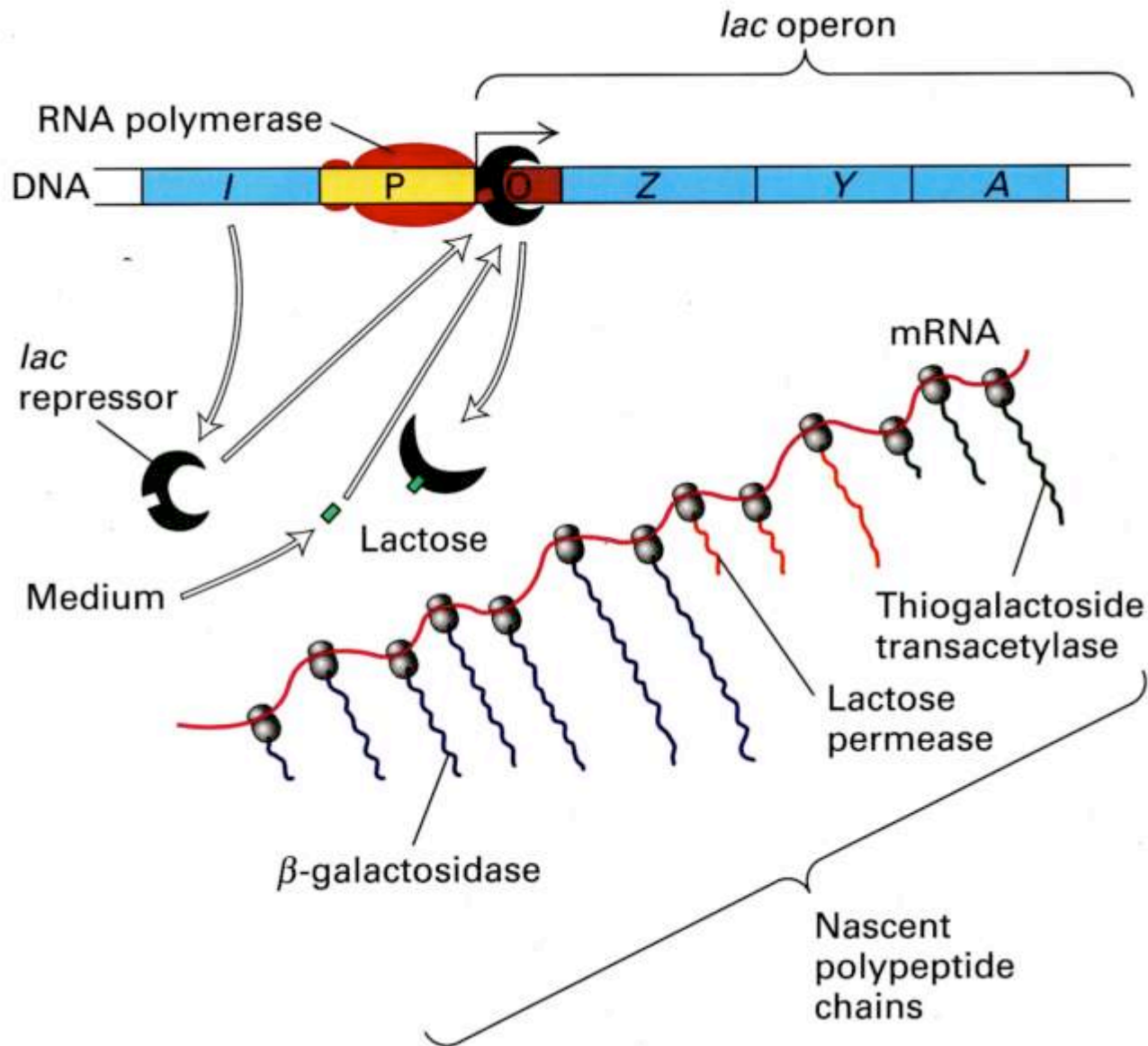
A. RNA polymerase

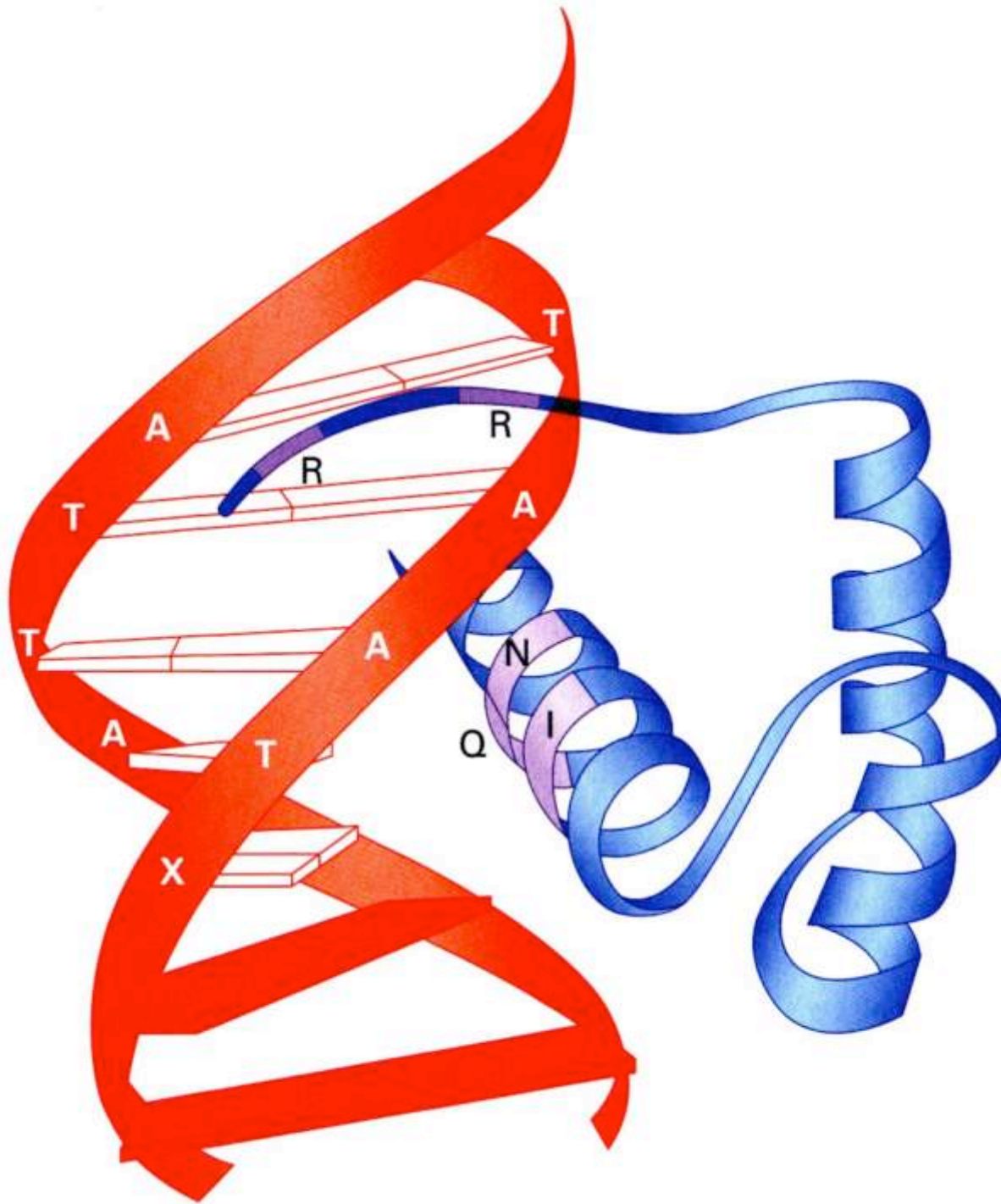


Aufgeschmolzene DNA am Ort der Transkription



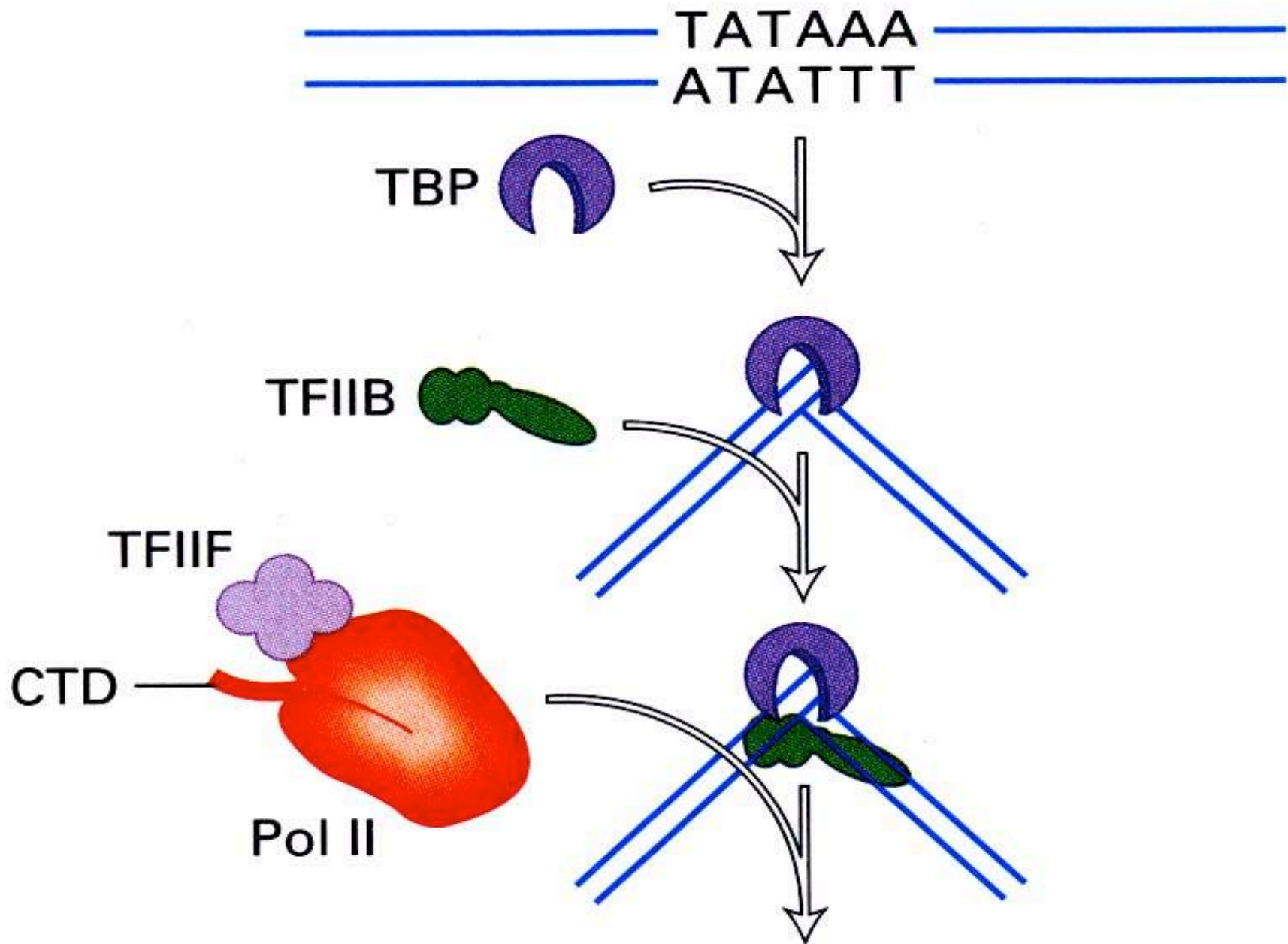
Regulation der Transkription des lac Operons in E. coli



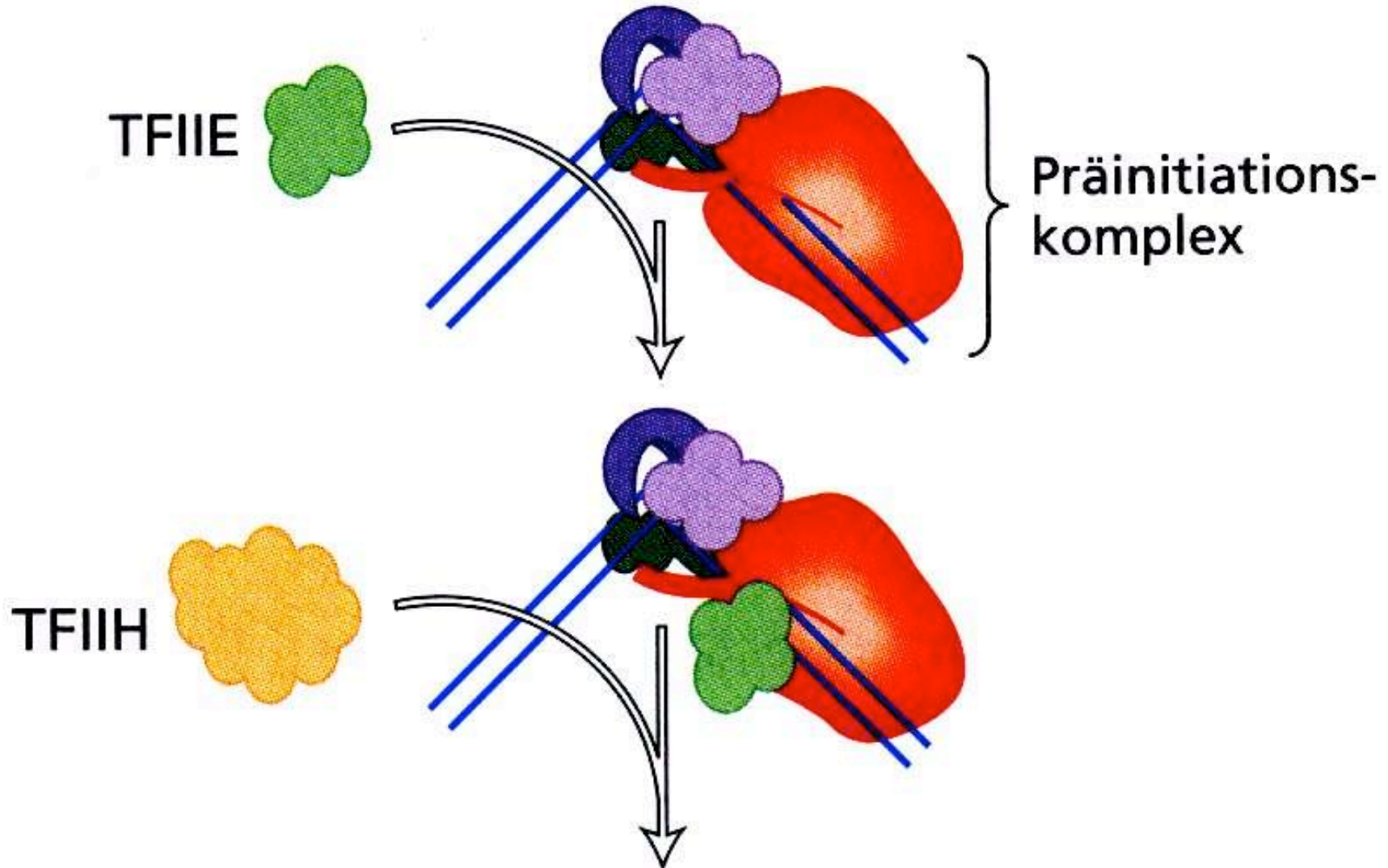


Struktur der
DNA Erkennungs-
domäne eines
DNA Bindungs-
proteins.

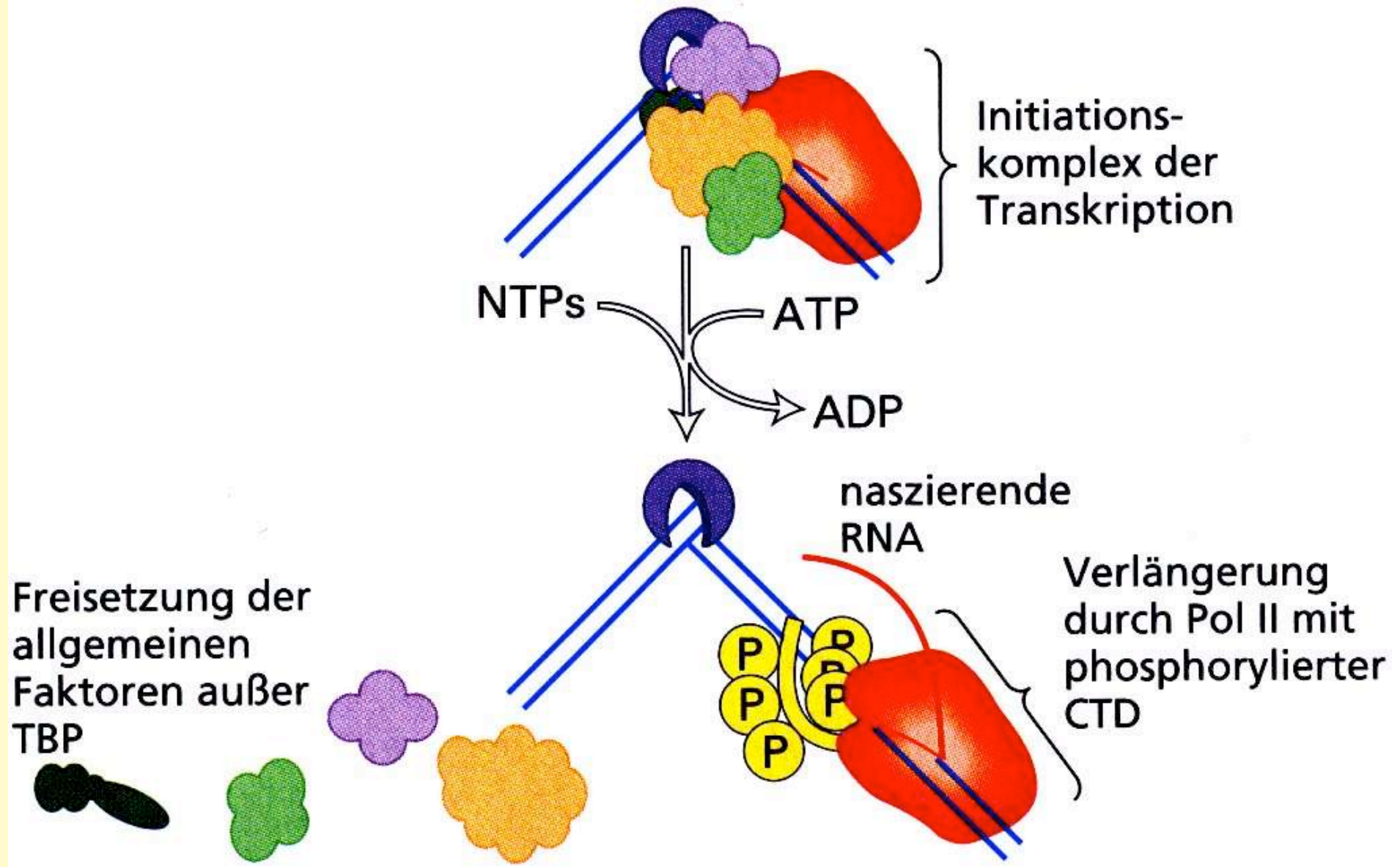
Schrittweiser Aufbau des Initiationskomplexes



Schrittweiser Aufbau des Initiationskomplexes



Schrittweiser Aufbau des Initiationskomplexes



Regulation der Transkription in Eukaryonten

