

The 2015 Nobel Prize in Physiology or Medicine

was divided, one half jointly to [William C. Campbell](#) and [Satoshi Ōmura](#) "for their discoveries concerning a novel therapy against infections caused by roundworm parasites" and the other half to [Youyou Tu](#) "for her discoveries concerning a novel therapy against Malaria".



William C. Campbell
(1930-)
Ireland / USA

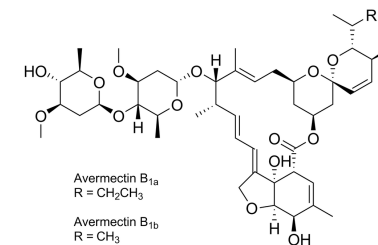
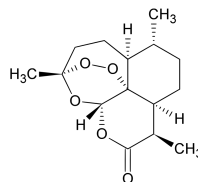


Satoshi Ōmura
(1935-)
Japan



Youyou Tu
(1930-)
China

Avermectin (→ ivermectin) – treatment of **River Blindness** and **Lymphatic Filariasis**, which are caused by parasitic worms
Artemisinin – treatment of **Malaria**



The 2015 Nobel Prize in Chemistry

“for mechanistic studies of DNA repair.”



**Tomas Lindahl
(1938-)
Sweden**



**Paul Modrich
(1946-)
USA**



**Aziz Sancar
(1946-)
Turkey/USA**

Mechanizmy opravy poškodení DNA

- Korekčné aktivity DNA polymerázy
- Fotoreaktivácia
- Excízna oprava (bázová a nukleotidová)
- Postreplikačná (mismatch) oprava
- Rekombinačná oprava
- SOS odpoveď

Na svetle

V tme

Počas replikácie

Po replikácii

Bezchybné (*error free*)

Mutagénne (*error prone*)

Korekčné aktivity DNA polymerázy

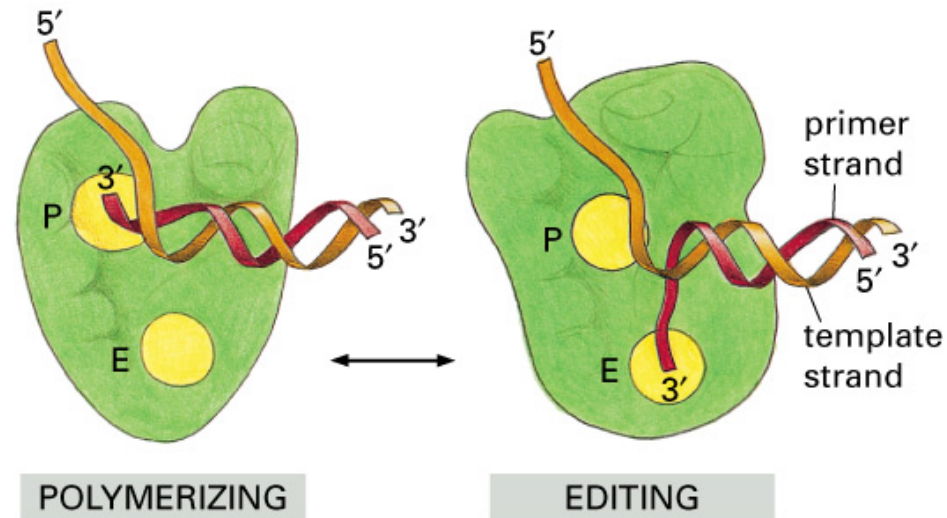
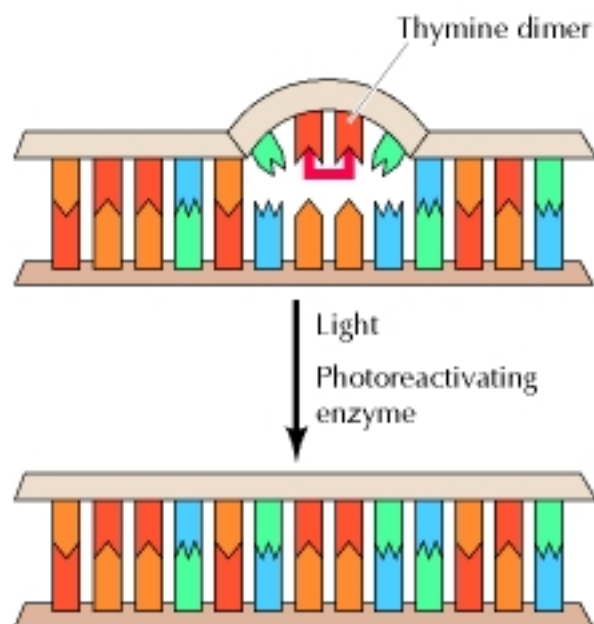


Figure 5–10. Molecular Biology of the Cell, 4th Edition.

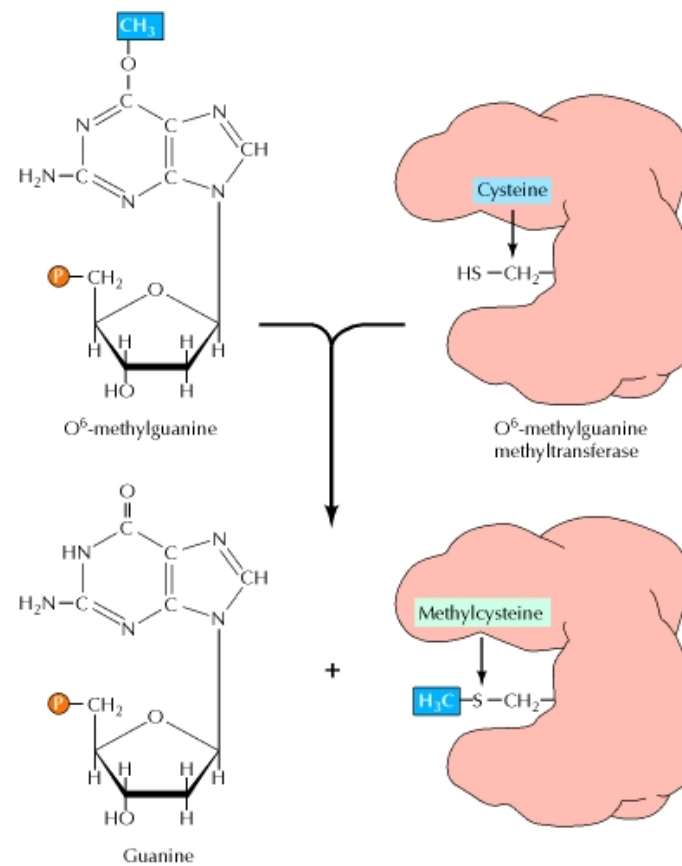
Enzymatické aktivity DNA polymerázy:

- 5' -3' polymeráza
- 5' -3' exonukleáza
- 3' -5' exonukleáza

Fotoreaktivácia (Fotoreparácia)



demetylácia / dealkylácia



Excízna oprava (bázová a nukleotidová)

(A) BASE EXCISION REPAIR

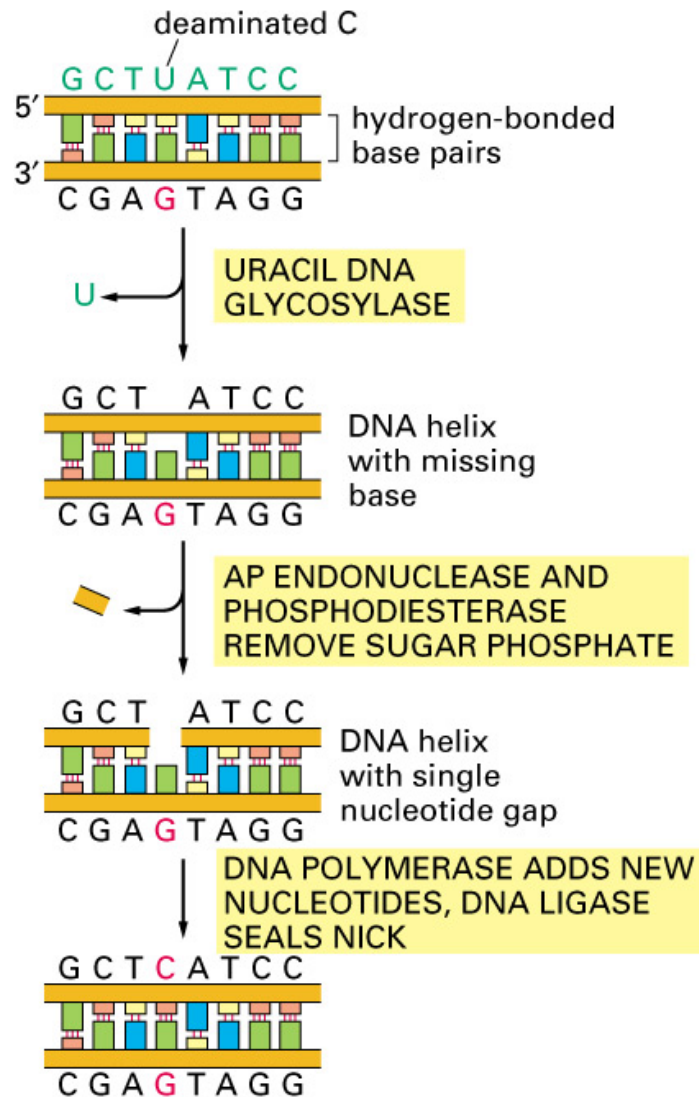


Figure 5-50 part 1 of 2. Molecular Biology of the Cell, 4th Edition.

(B) NUCLEOTIDE EXCISION REPAIR

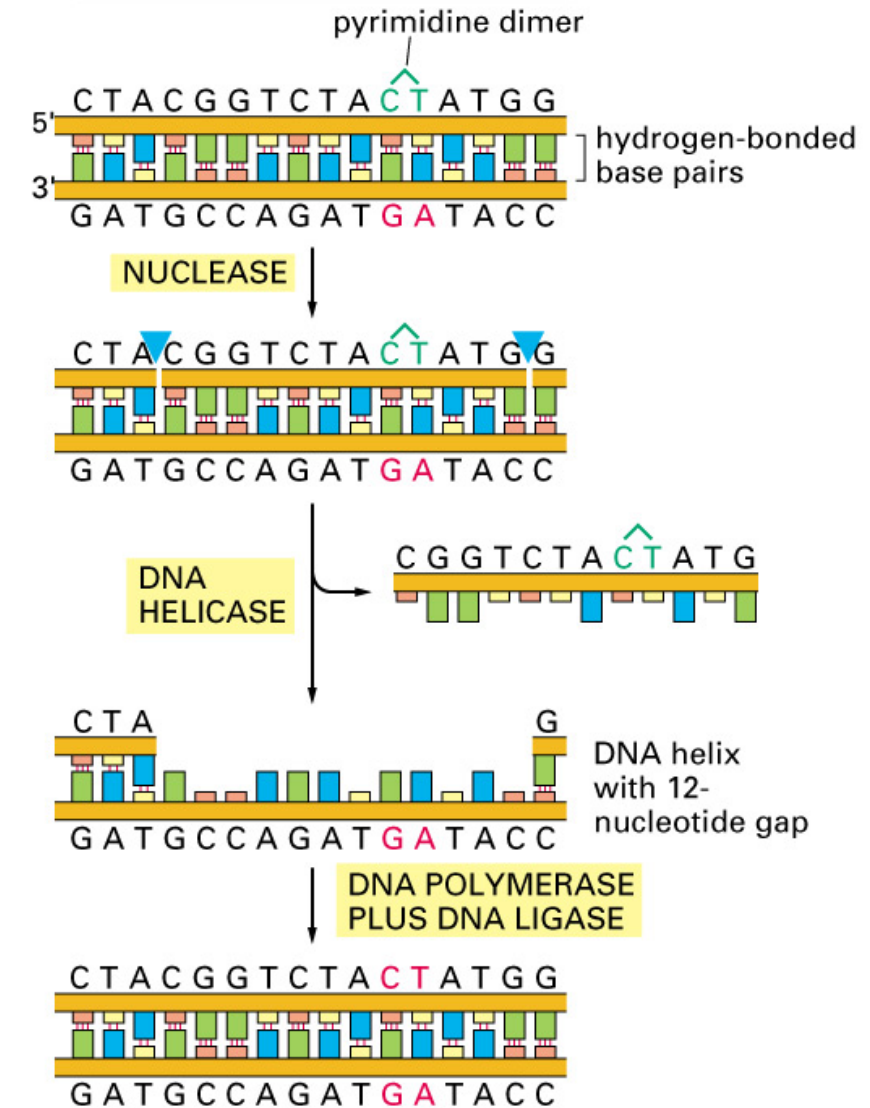


Figure 5-50 part 2 of 2. Molecular Biology of the Cell, 4th Edition.

Excízna oprava (bázová a nukleotidová)

(A) BASE EXCISION REPAIR

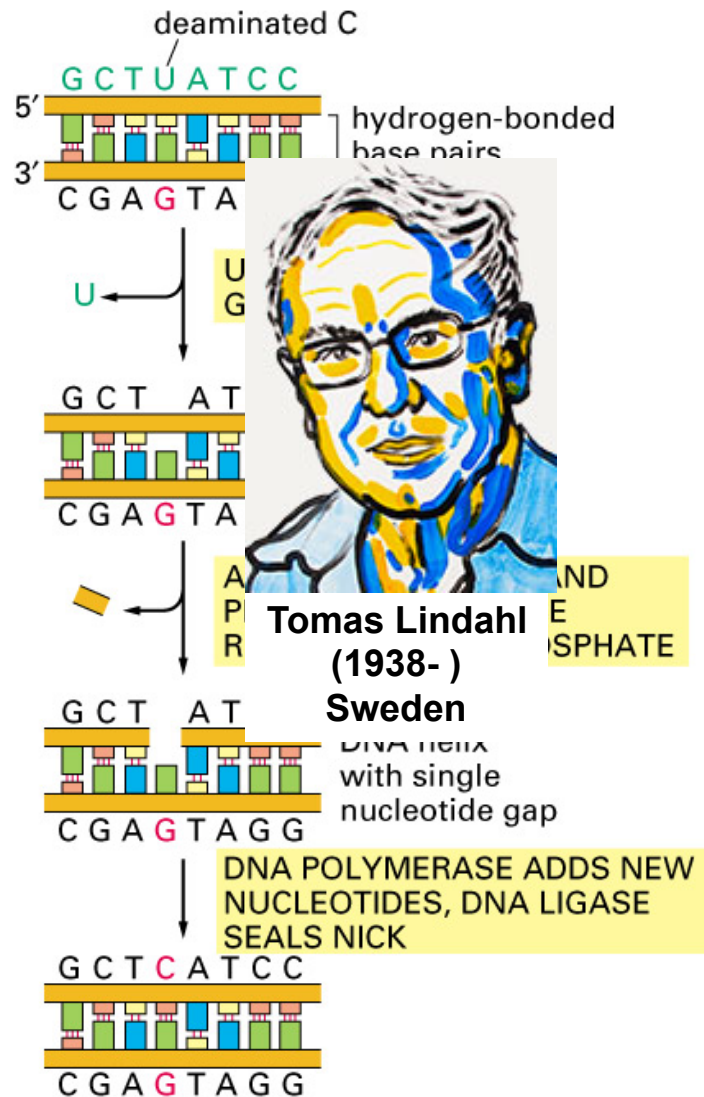


Figure 5-50 part 1 of 2. Molecular Biology of the Cell, 4th Edition.

(B) NUCLEOTIDE EXCISION REPAIR

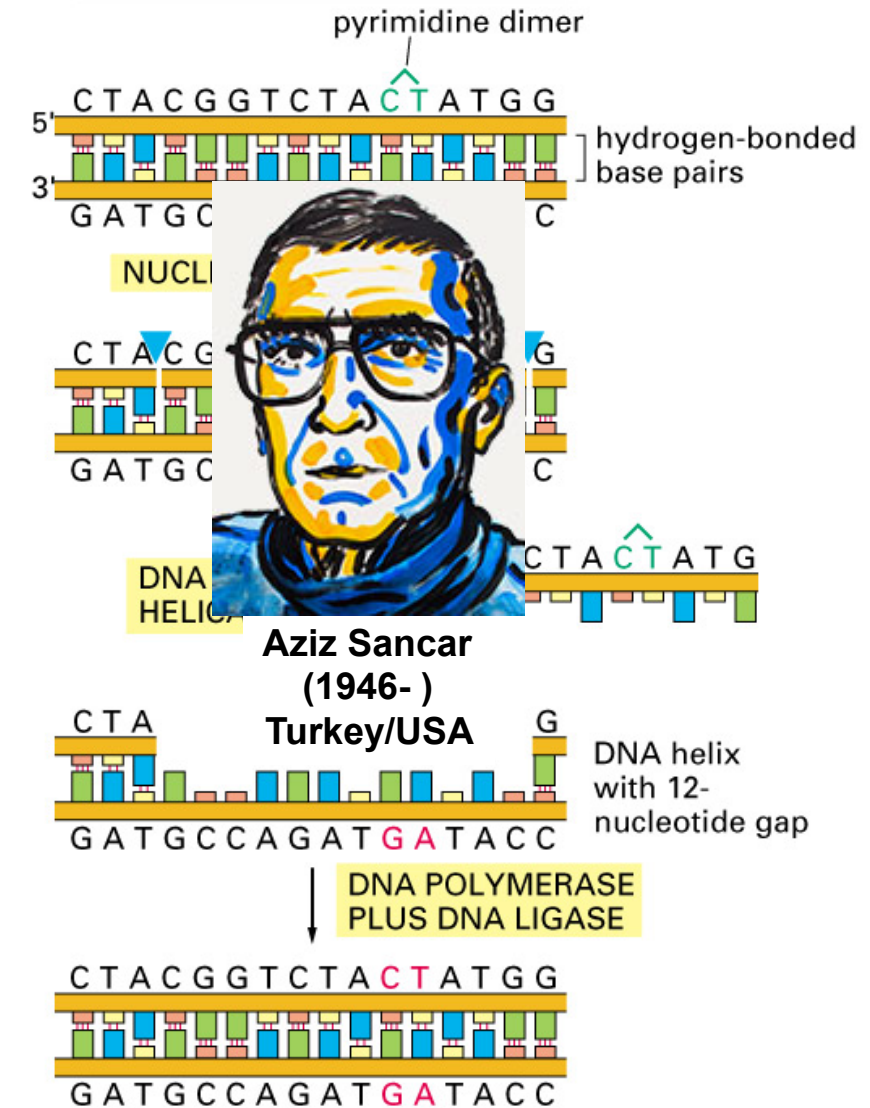
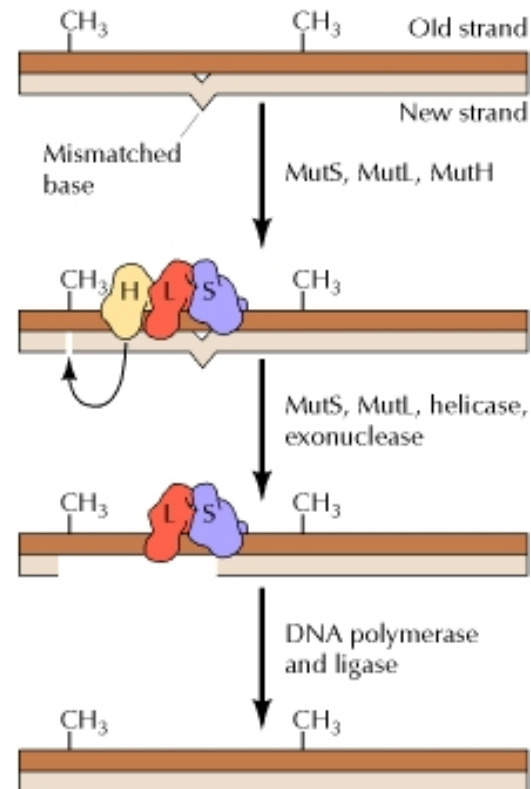


Figure 5-50 part 2 of 2. Molecular Biology of the Cell, 4th Edition.

Postreplikačná (mismatch) oprava DNA



Paul Modrich
(1946-)
USA

Opravy dvojláknových zlomov v DNA rekombináciou

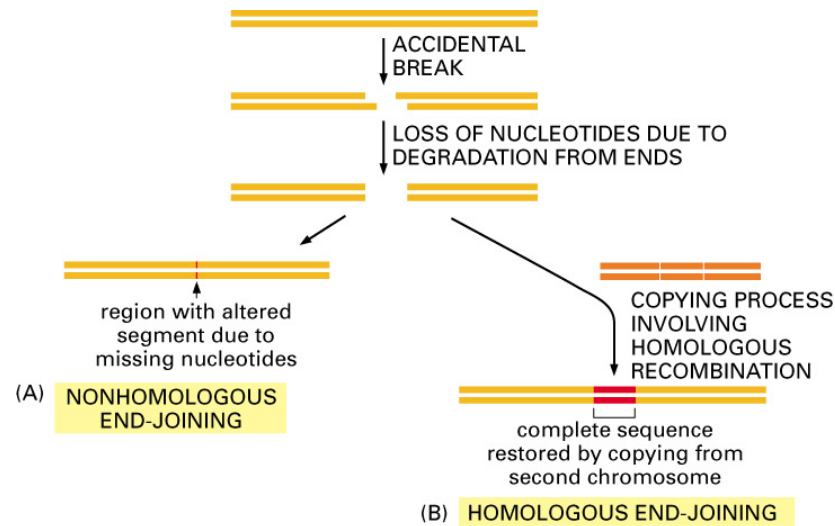
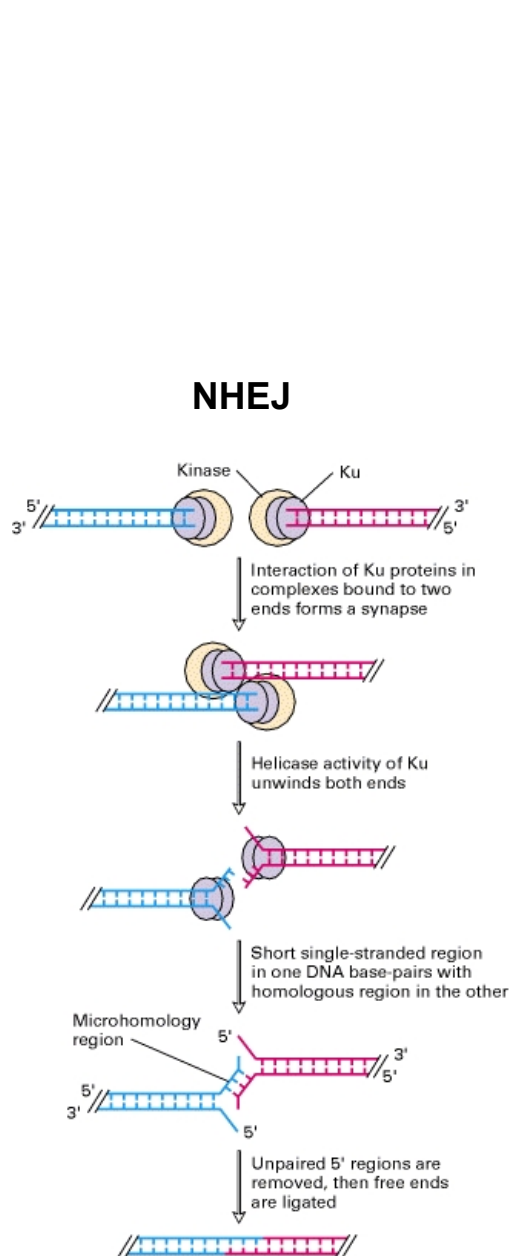
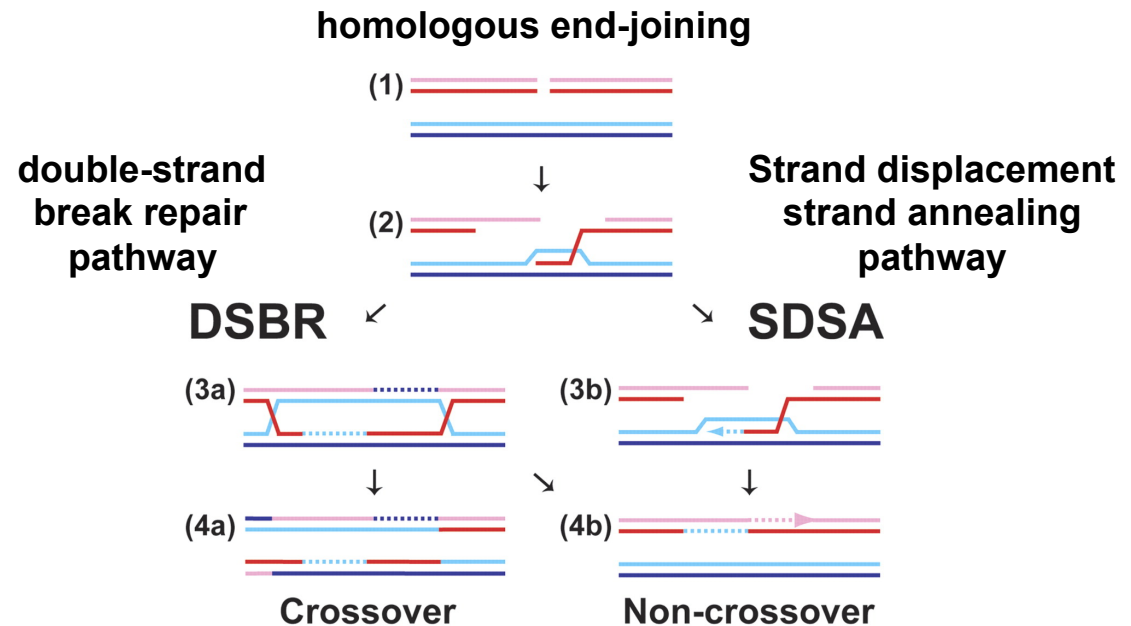


Figure 5-53. Molecular Biology of the Cell, 4th Edition.



Ochorenia spôsobené poškodením reparačných mechanizmov

• Ataxia telangiectasia	ATM proteín, kináza aktivovaná DSB
• Bloomov syndróm	DNA helikáza
• Cockaynov syndróm	porucha opravy DNA (ERCC6, ERCC8)
• Fanconiho anémia	porucha opravy krížových väzieb v DNA
• Werner syndrome	WRN helikáza
• Xeroderma pigmentosum	porucha nukleotidovej ER

Typické prejavy:

Poruchy v oprave poškodení DNA

Citlivosť k UV-žiareniu

Nestabilita genómu

Zrýchlené starnutie

Tvorba nádorov

Pacienti s XP

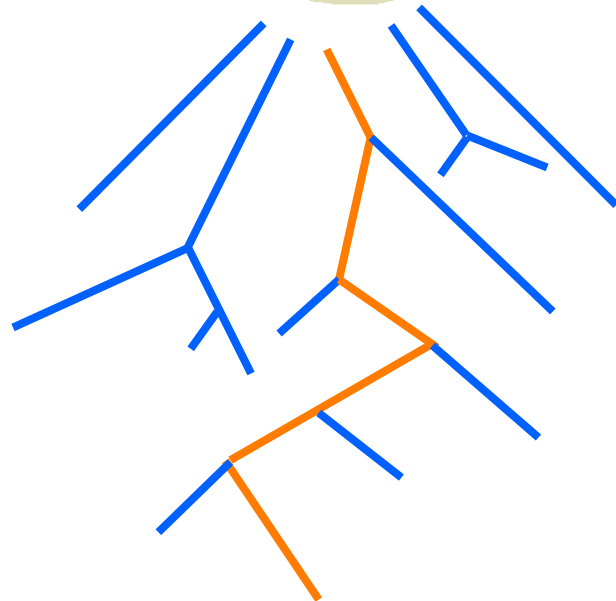


3. Transkripcia a úlohy RNA v bunke.

- Katalytické vlastnosti RNA. Svet RNA a evolúcia živých systémov.
- Úloha RNA v interpretácii genetickej informácie.
- Typy RNA (mRNA, rRNA, tRNA, malé RNA).
- Transkripcia. Iniciácia, elongácia a terminácia transkripcie.
- RNA polymerázy. Transkripčné faktory.
- Porovnanie transkripcie v prokaryotoch a eukaryotoch.



RNA mala kľúčovú úlohu v evolúcii živých systémov



Progenote
Bacteria **Archaea** **Eukarya**

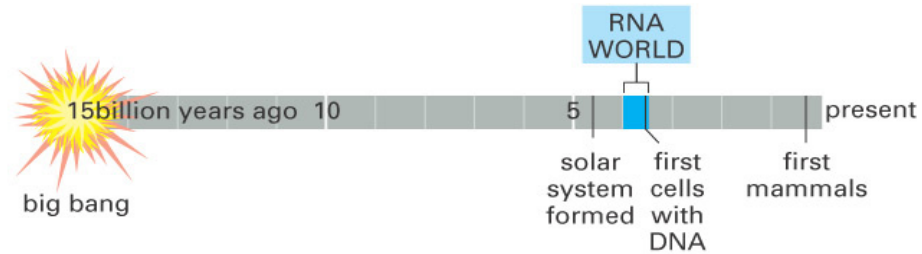


Figure 7-38 Essential Cell Biology, 2/e. (© 2004 Garland Science)

svet RNA

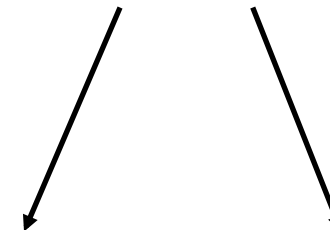
svet RNP

svet DNA

RNA
genotyp + fenotyp



RNP
genotyp + fenotyp



DNA
genotyp

proteíny (+ RNA)
fenotyp

Informačné biomakromolekuly

(furanosyl) RNA pyranosyl RNA peptidová nukleová kyselina

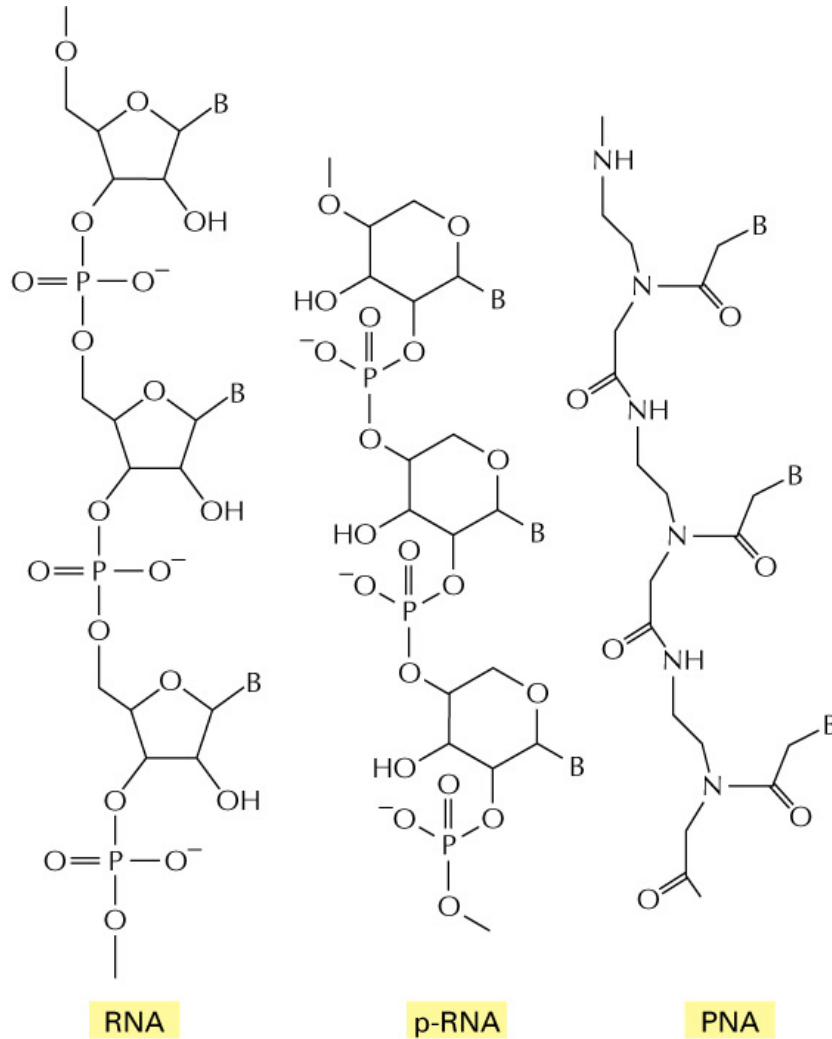


Figure 6-93. Molecular Biology of the Cell, 4th Edition.

replikátor vs. replikant

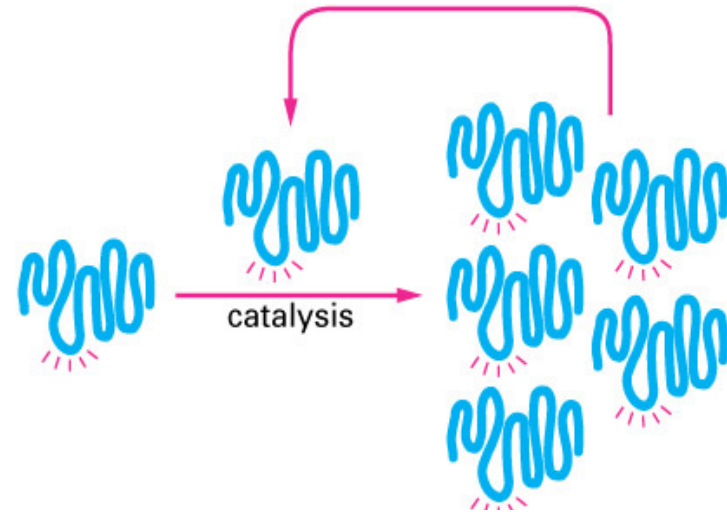


Figure 7-41 Essential Cell Biology, 2/e. (© 2004 Garland Science)

+ DNA
+ proteíny

Štruktúrne prvky v RNA

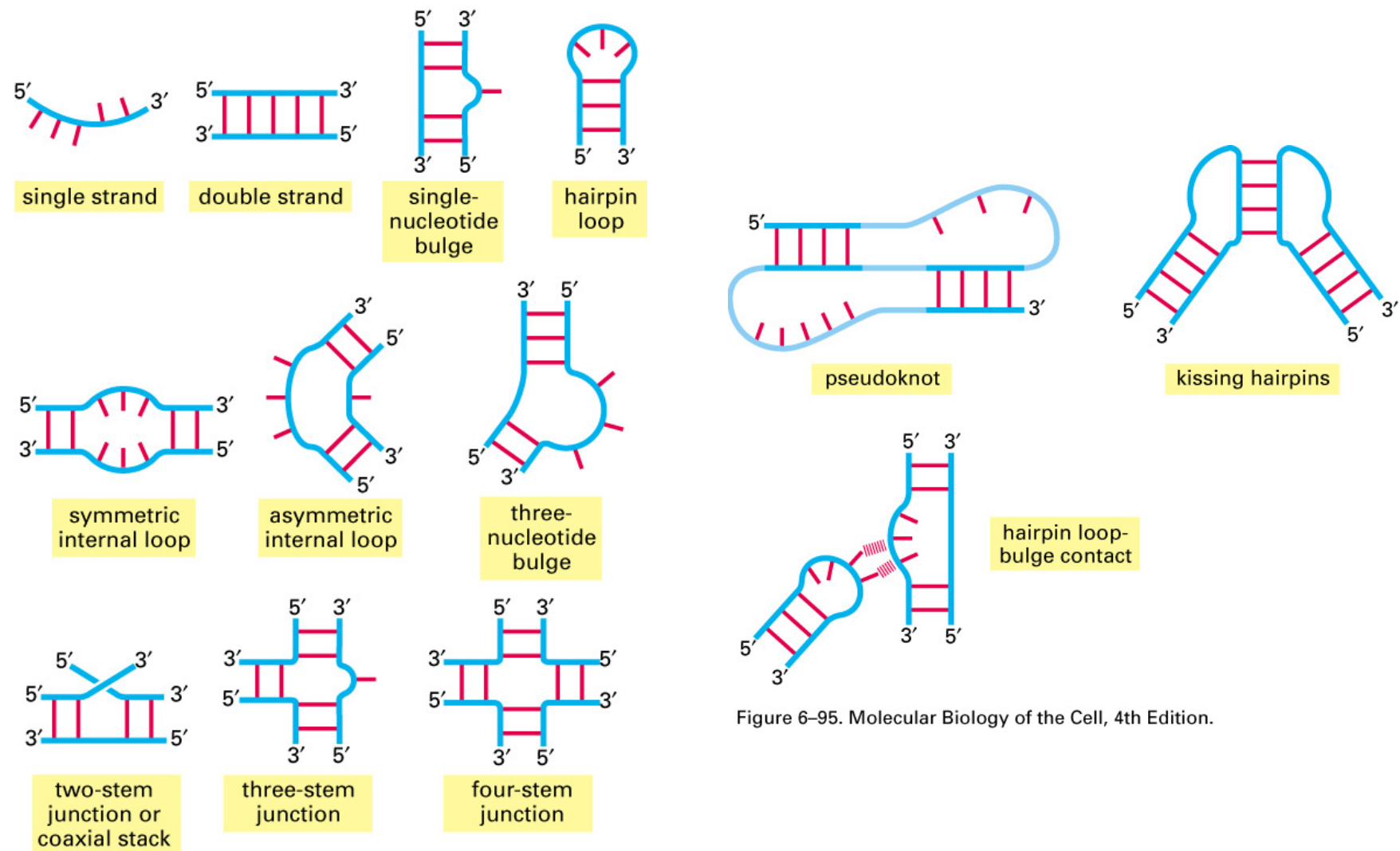


Figure 6-94. Molecular Biology of the Cell, 4th Edition.

Figure 6-95. Molecular Biology of the Cell, 4th Edition.

The Nobel Prize in Chemistry 1989 was awarded jointly to Sidney Altman and Thomas R. Cech
"for their discovery of catalytic properties of RNA"



Sidney Altman
(1939-)
Canada, USA



Thomas R. Cech
(1947-)
USA

RNA enzyým - ribozým

RNáza P (*processing* pre-tRNA)

= 14 kDa proteín + 377 nt RNA (= M1 RNA)

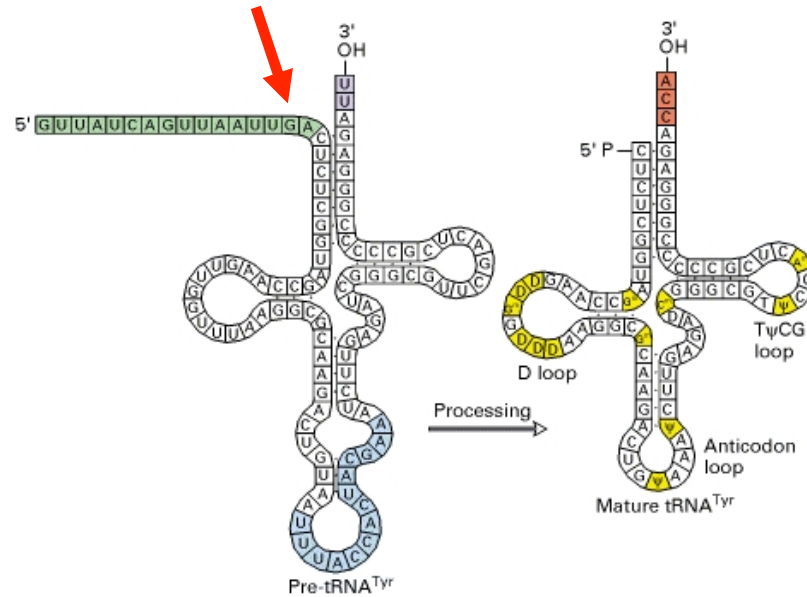
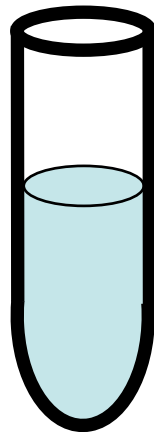


Figure 11-52. Molecular Cell Biology, 4th edition.



		aktivita
+ proteín + RNA	→	+
- proteín + RNA	→	-
+ proteín - RNA	→	-
+ proteín + Mg ²⁺ - RNA	→	-
- proteín + Mg²⁺ + RNA	→	+

Autokatalyticky sa vyštepujúci intrón (*self-splicing intron*) splicing pre-rRNA v bunkách prvoka *Tetrahymena*

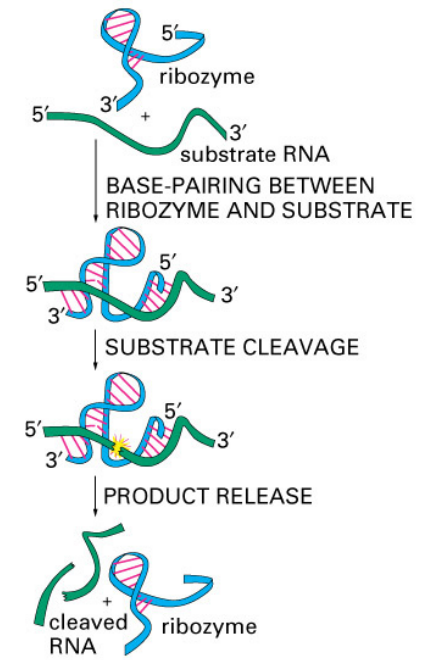
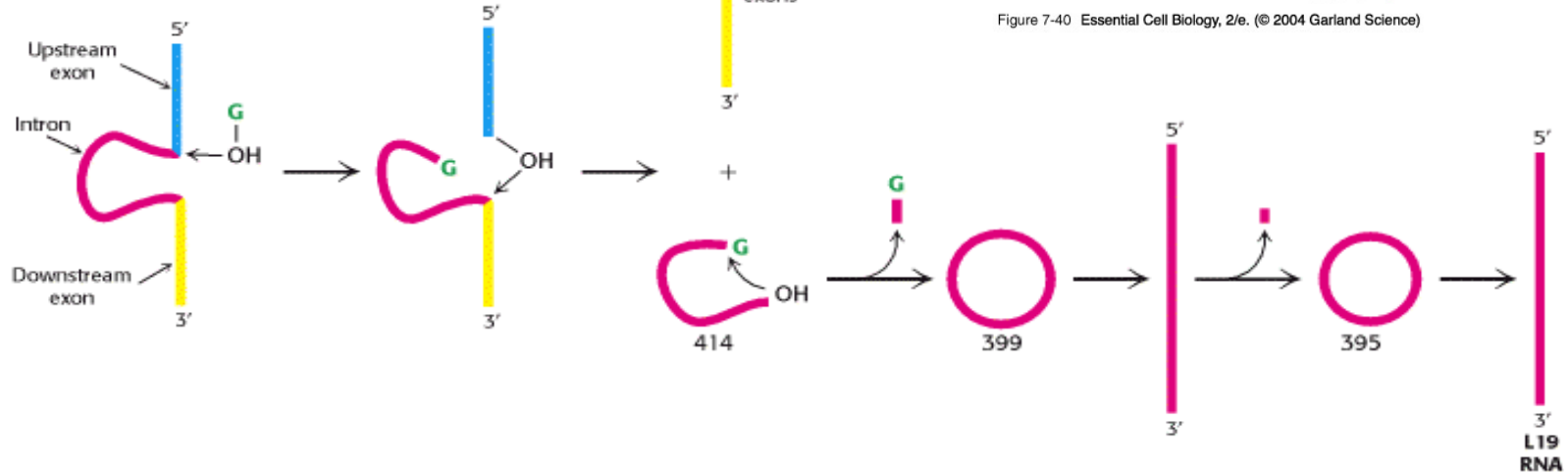
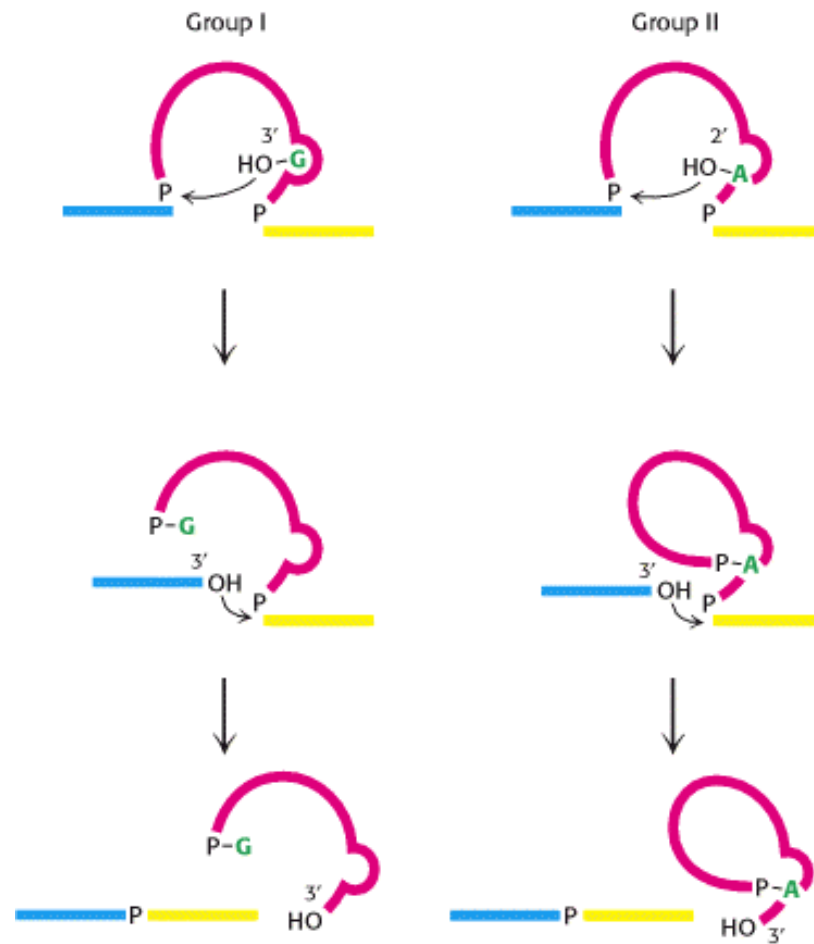


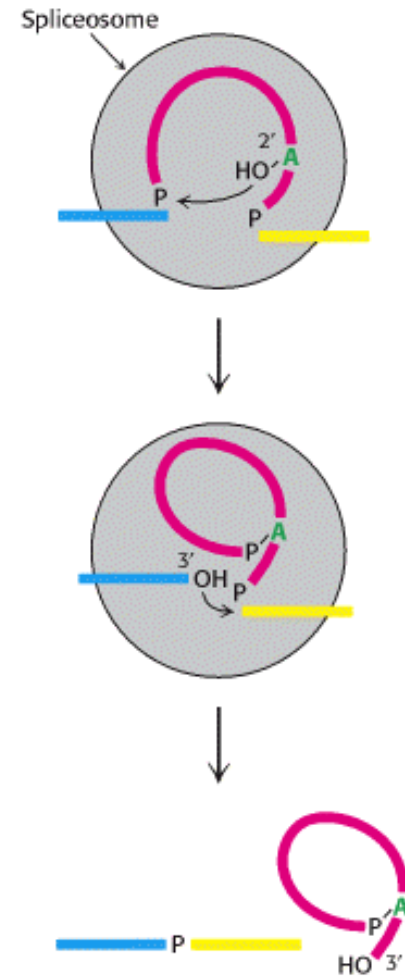
Figure 7-40 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Mechanizmy zotrihu RNA (*splicing*)

SELF-SPLICING INTRONS



SPLICEOSOME-CATALYZED SPLICING OF NUCLEAR mRNA



Intróny II. skupiny

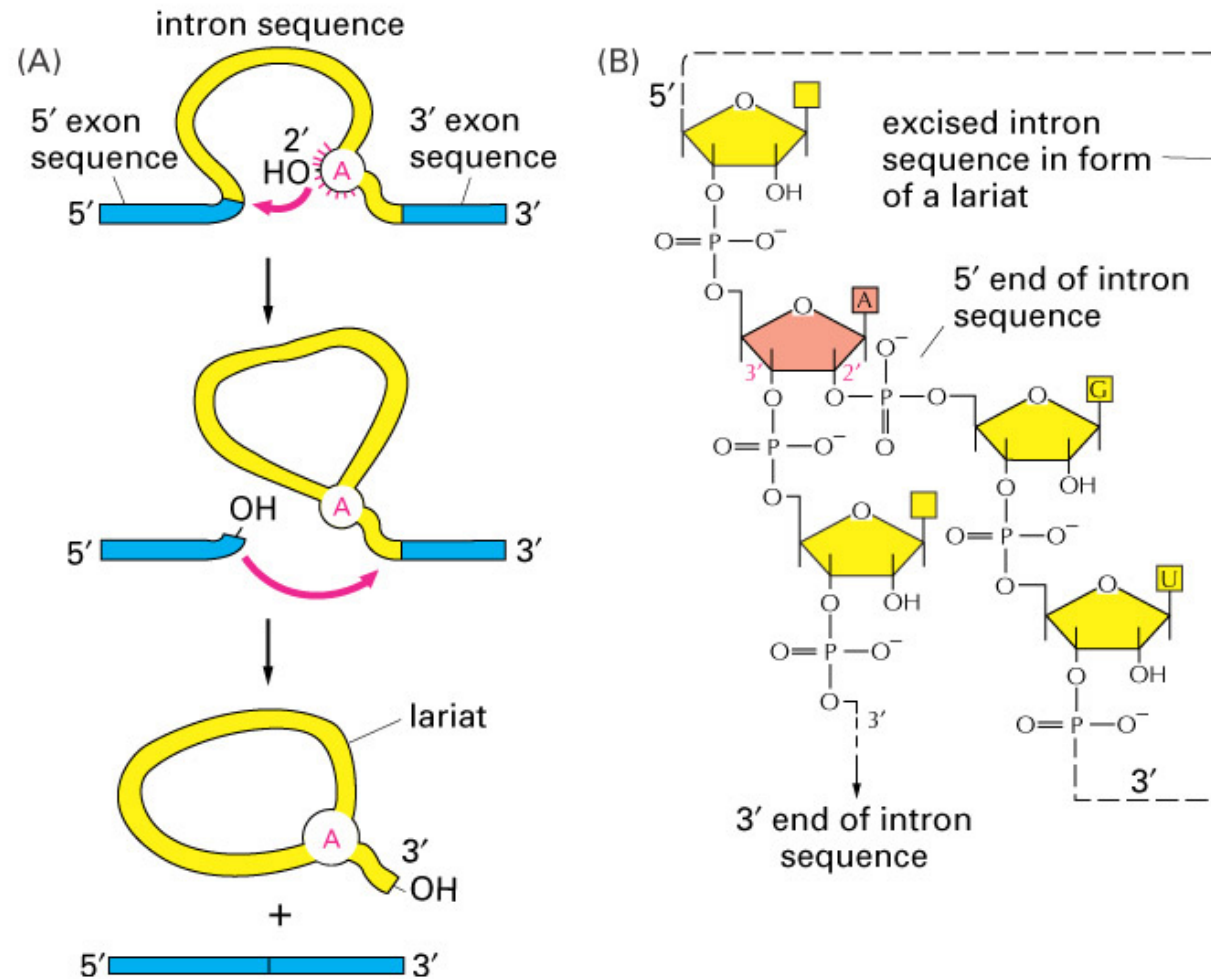


Figure 7-16 Essential Cell Biology, 2/e. (© 2004 Garland Science)

transesterifikačná reakcia

Typy a úlohy RNA v bunkách

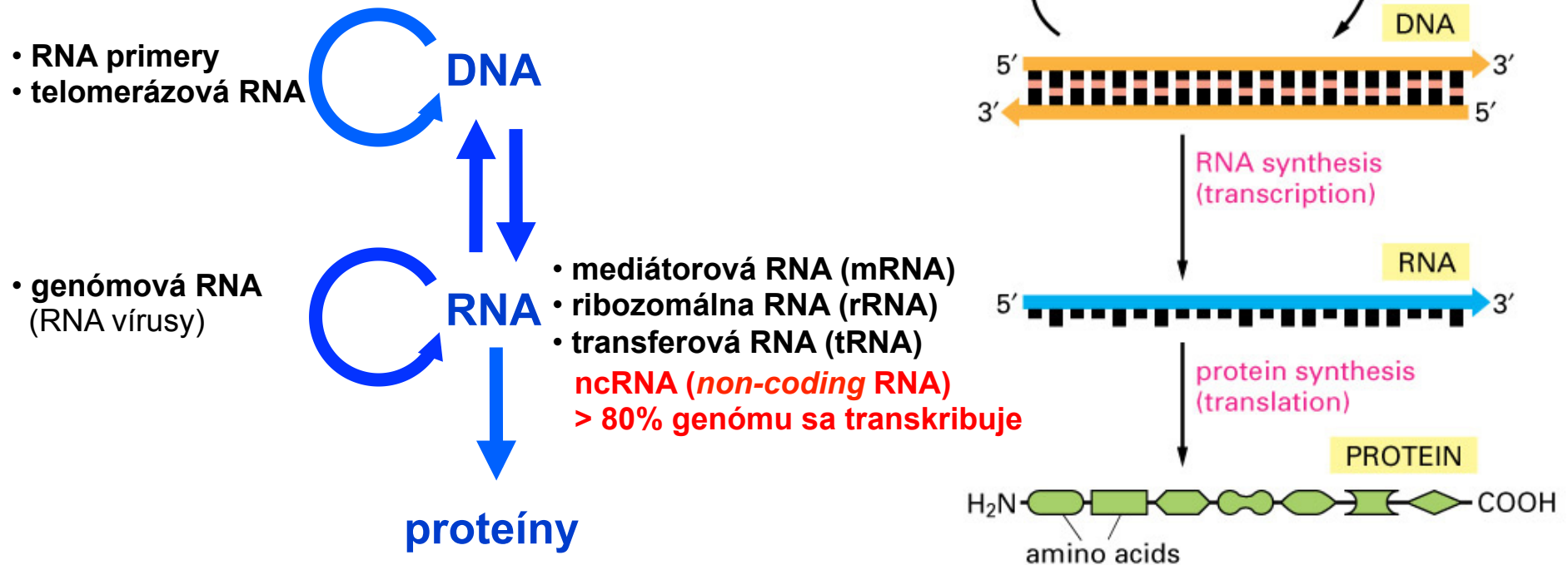


Figure 7-1 Essential Cell Biology, 2/e. (© 2004 Garland Science)

The Nobel Prize in Physiology or Medicine 1993 was awarded jointly to Richard J. Roberts and Phillip A. Sharp ***"for their discoveries of split genes"***



Richard J. Roberts
(1943-)
United Kingdom / USA

Phillip A. Sharp
(1944-)
USA

Nobelprize.org

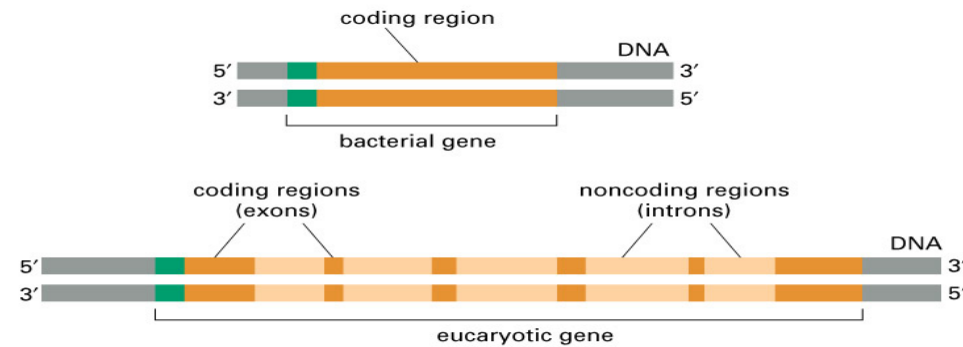


Figure 7-13 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Zostrih RNA (*splicing*) - spliceozóm

snRNA (*small nuclear RNA*) - snRNP (*sn ribonucleoprotein*)

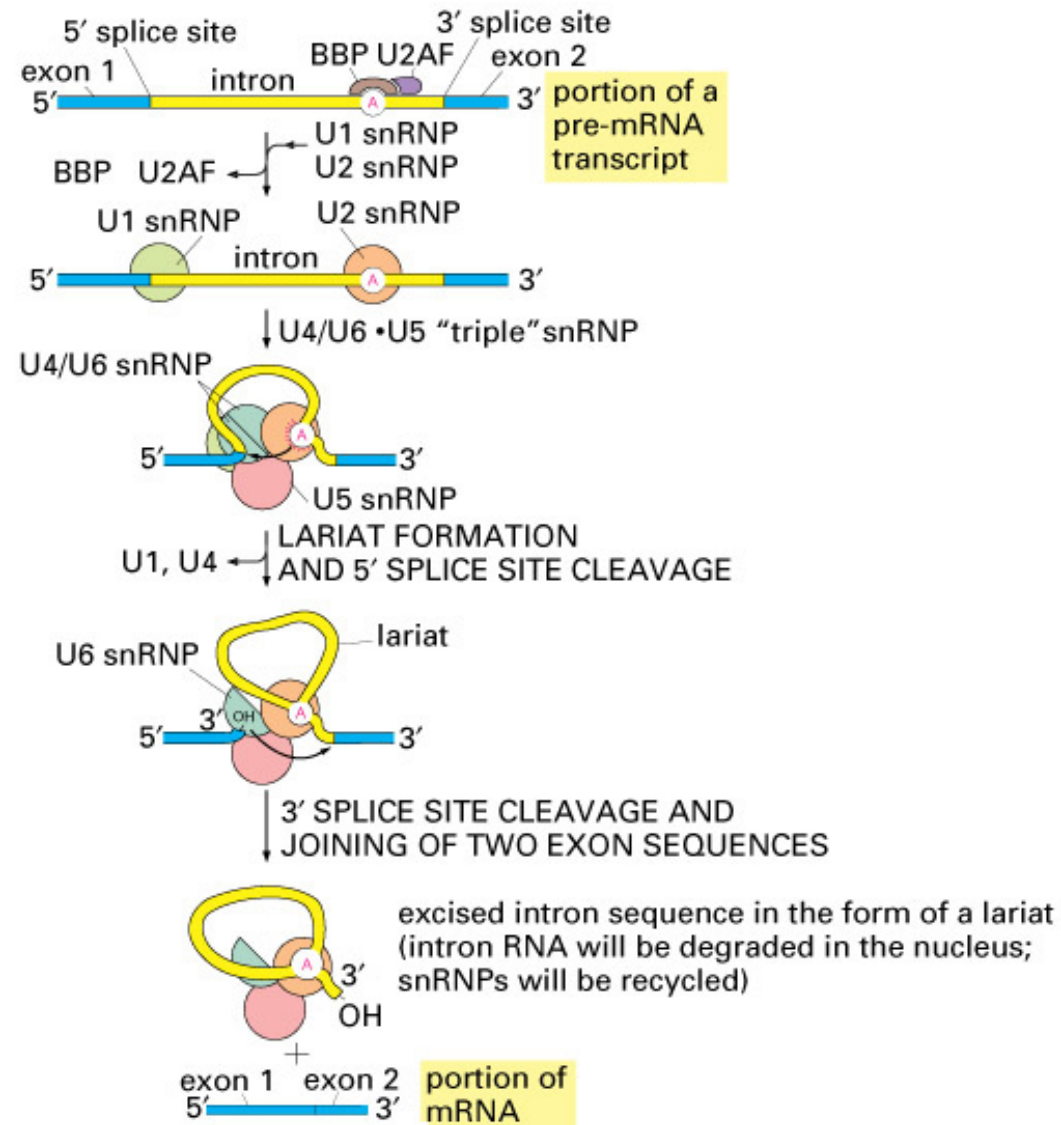


Figure 7-17 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Editovanie RNA (RNA editing)

guide RNA v mitochondriách prvoka *Trypanosoma*

