

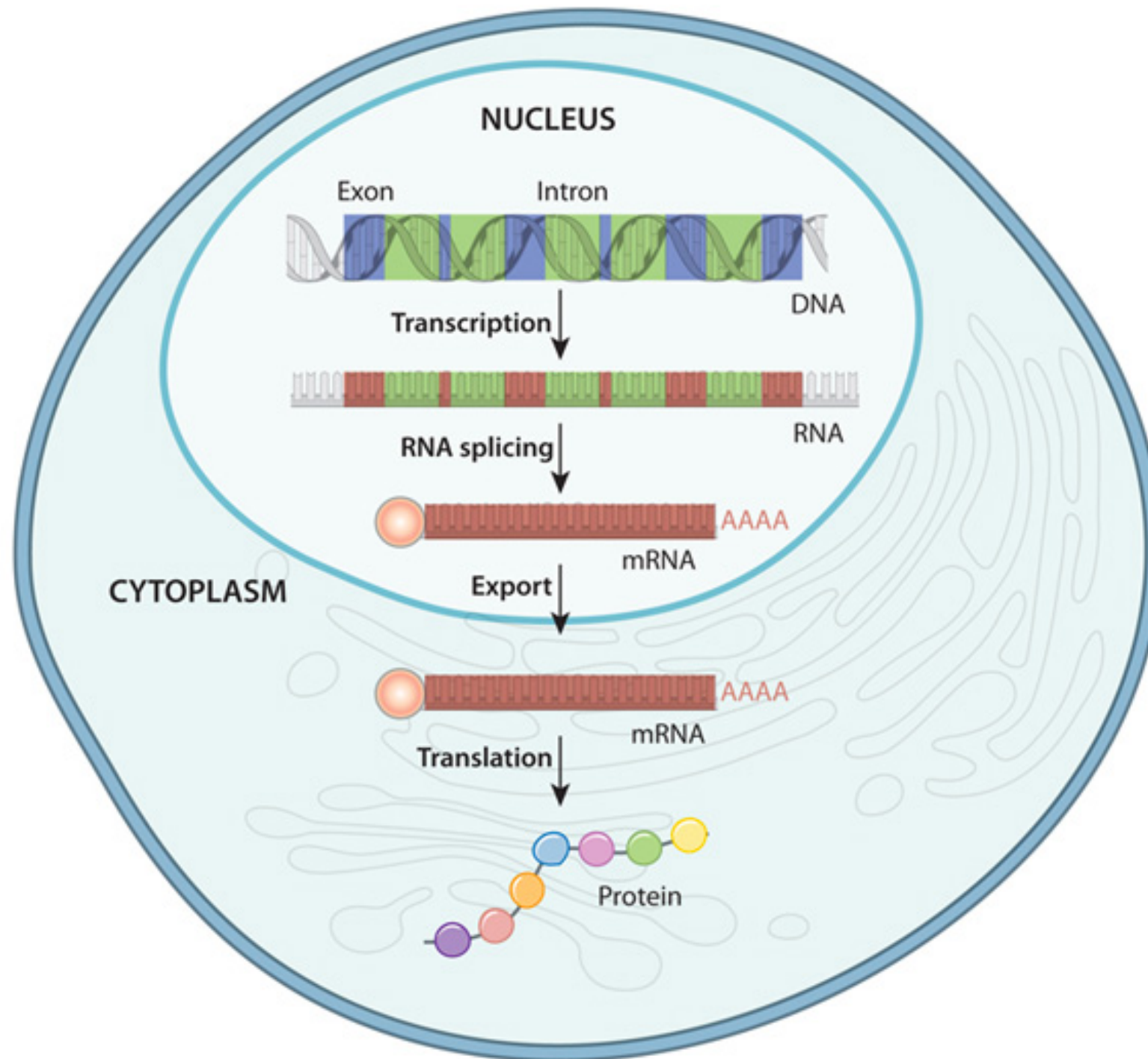
Module 9 :

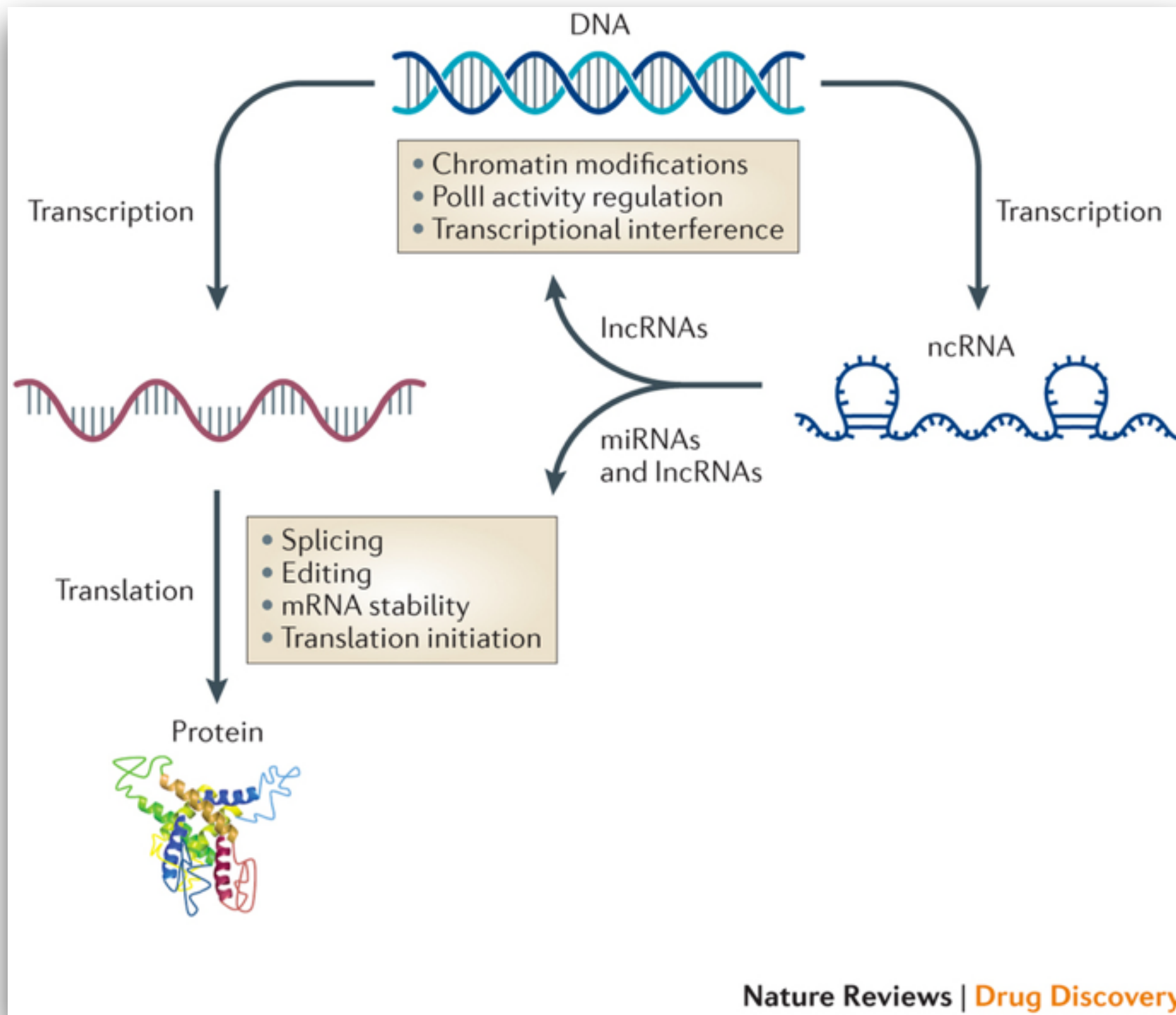
Functional non-coding RNA

13th May 2015

Rob Finn

From Gene to Protein





Classes of ncRNA

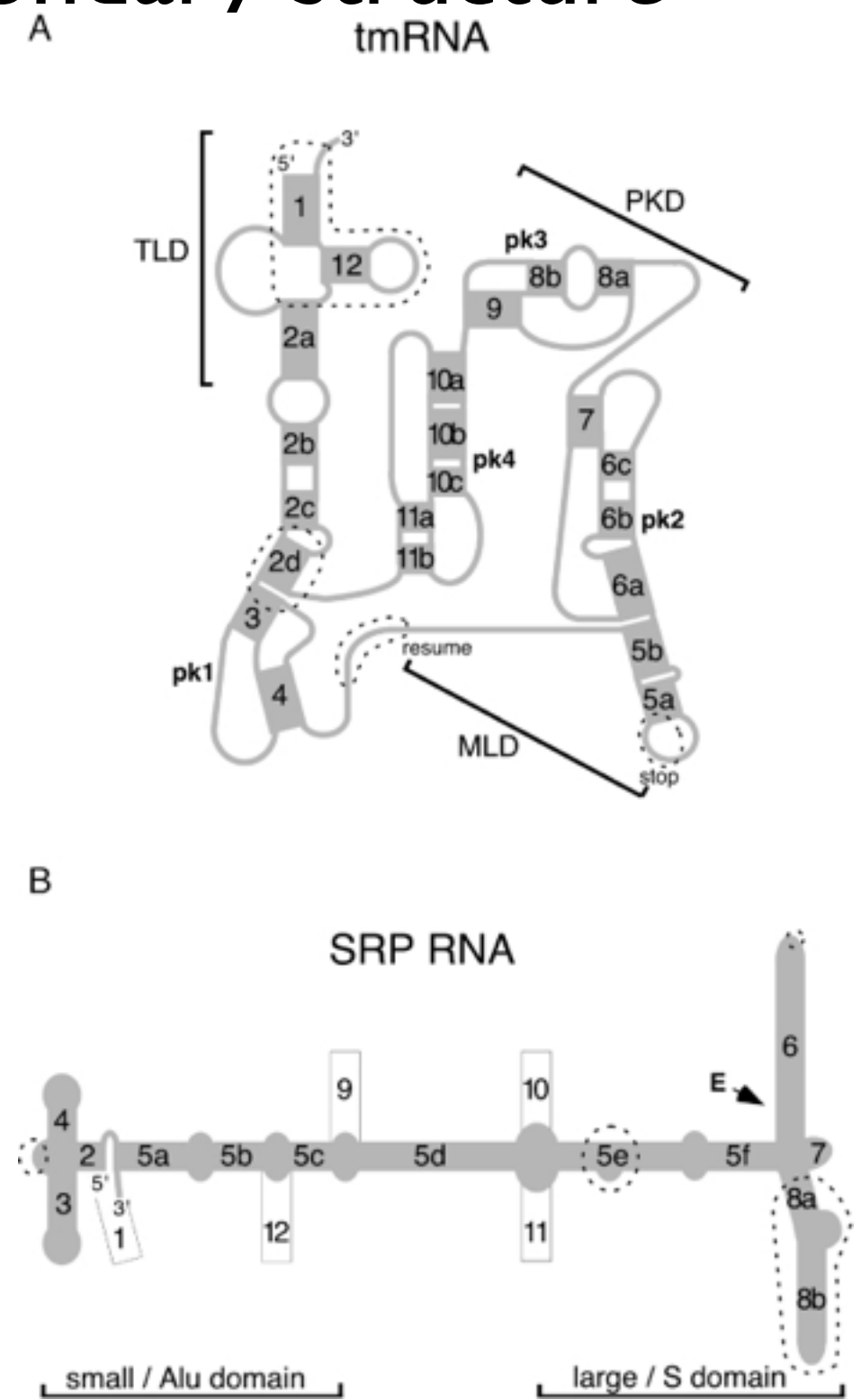
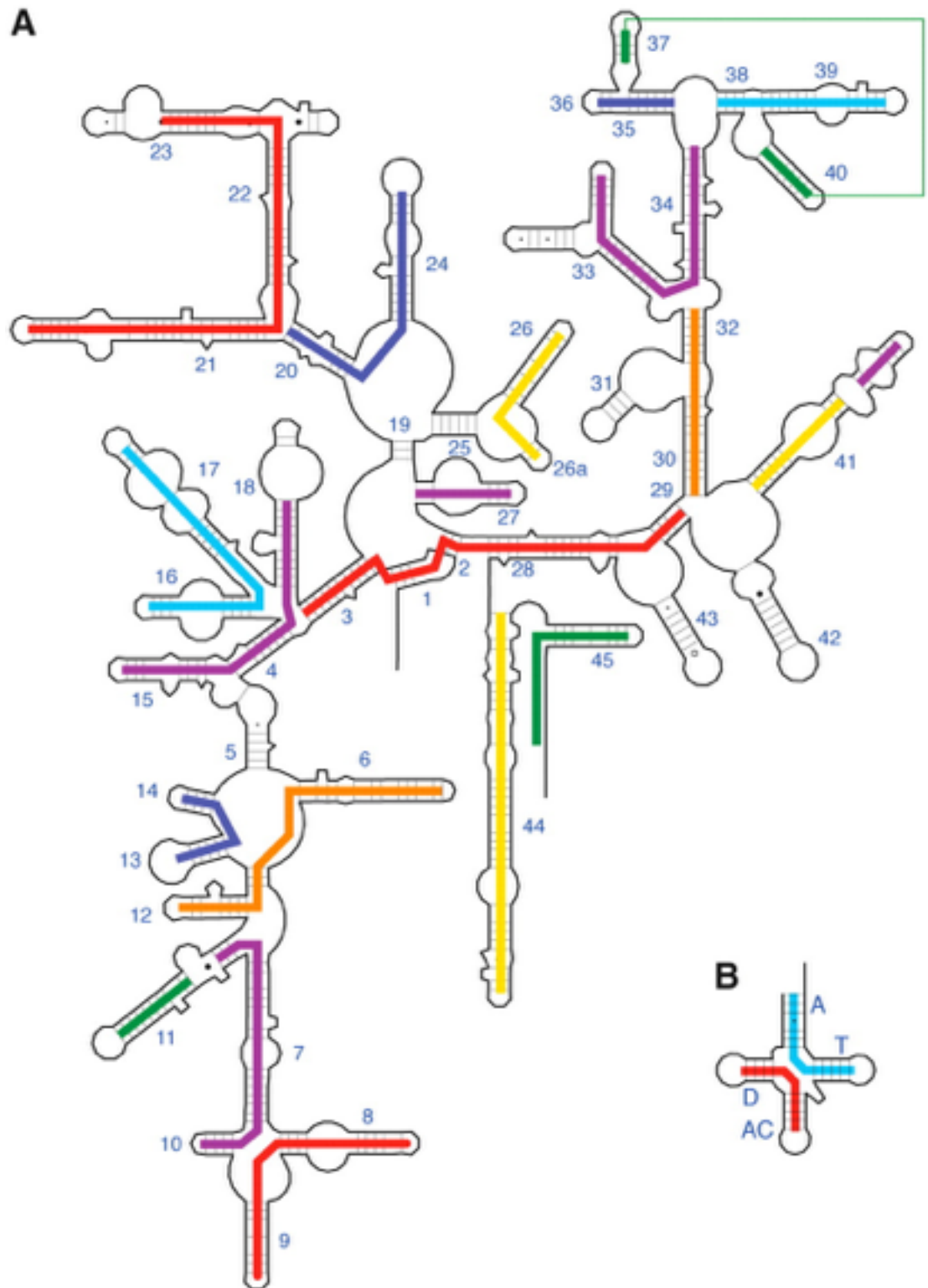
- rRNA - ribosomal
- tRNA - transfer RNA
- tmRNA - transfer-messenger
- Riboswitches
 - regulatory segments of mRNA that bind ligands and regulate expression
- SRP - Signal Recognition particle
 - Ribonucleoprotein for protein trafficking
- snoRNAs - small nucleolar RNAs
 - Process pre-rRNA, methylations and pseudouridylations

Classes of ncRNA

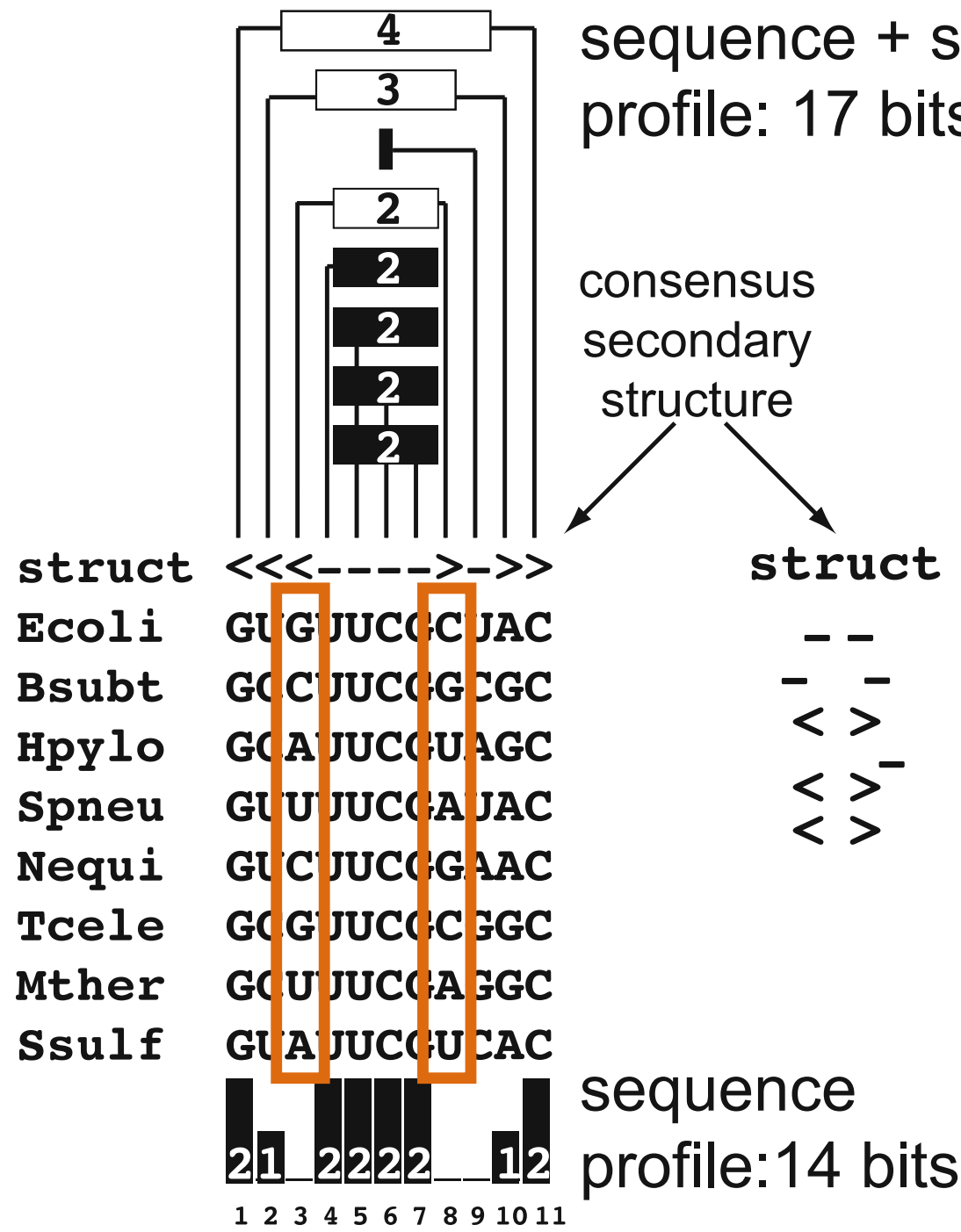
- miRNA - mircoRNA
 - transcription regulation
- PiRNA - Piwi Interacting RNA
- lncRNA - long non-coding
- siRNA - short interfering RNA
- RNaseP - RNA cleaving ribonuclease
- Group I and II introns - self-catalytic ribozymes
- Circular RNAs
- snRNPs - small nuclear ribonucleic proteins
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So what unifies these?

- Most have conserved secondary structure



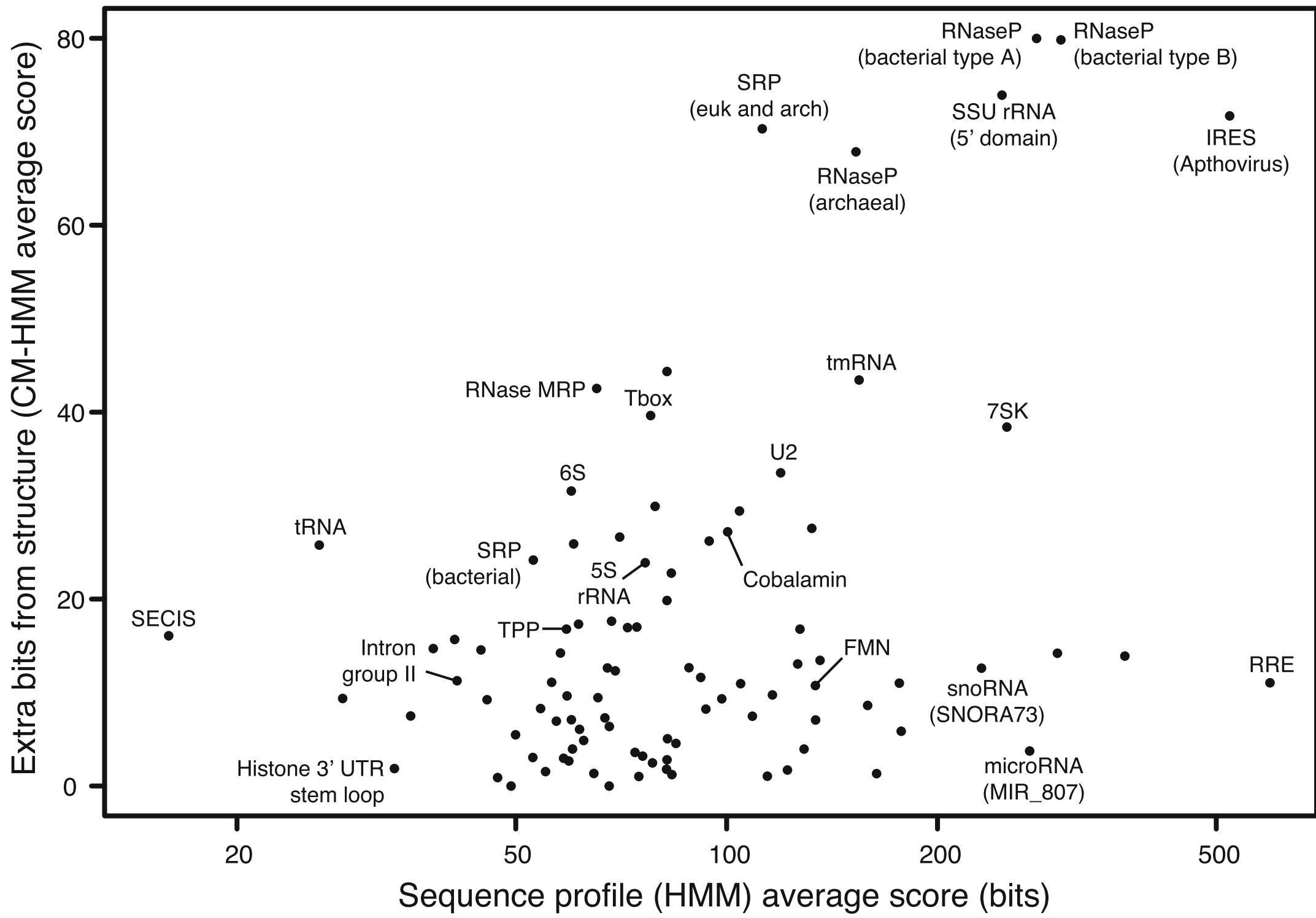
Characteristics of ncRNA



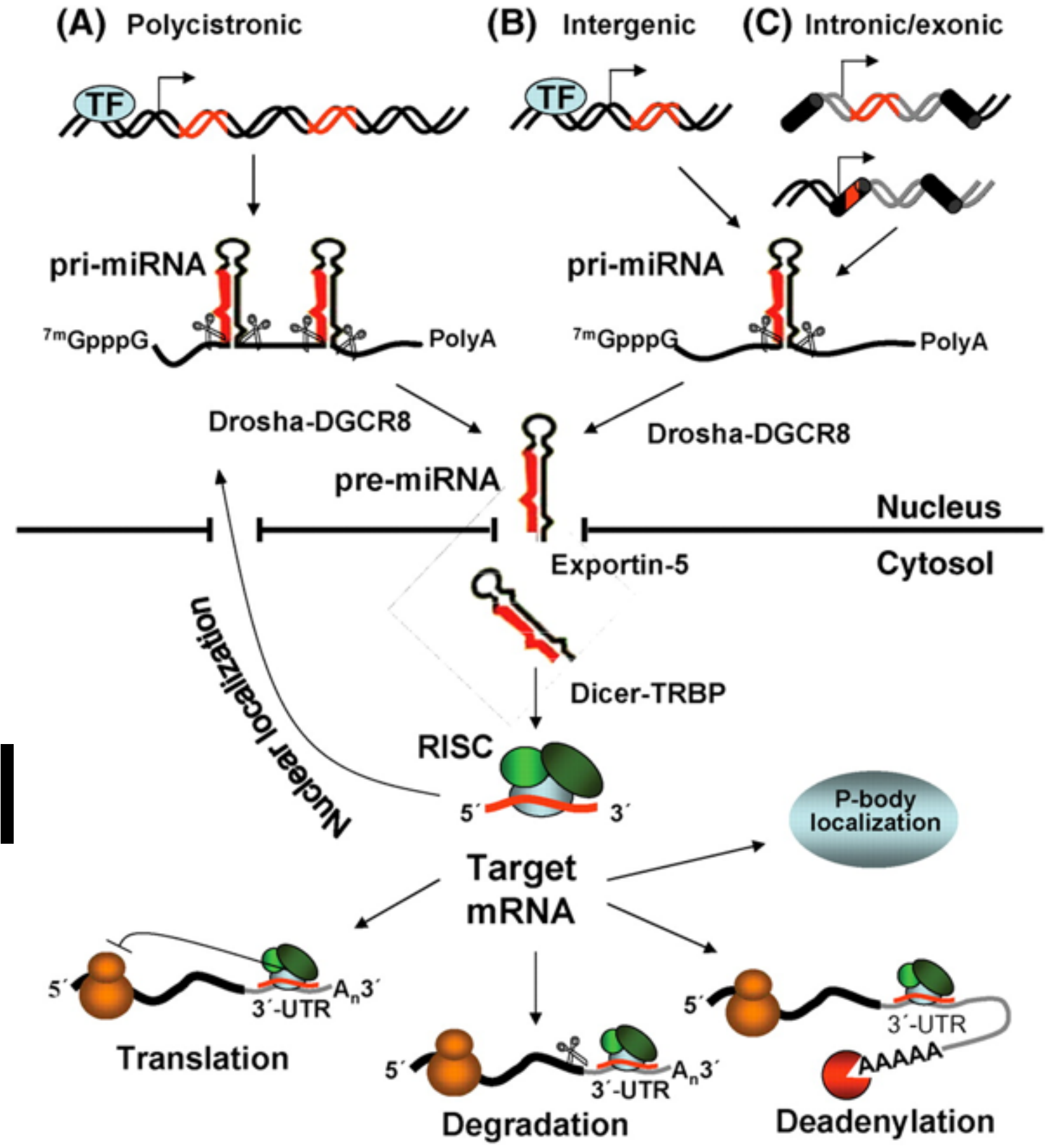
individual secondary structures

Ecoli	Bsubt	Hpylo	Spneu
UC	UC	UC	UC
U G	U G	U G	U G
G·C	C·G	A·U	U·A
U·A ^U	C·G ^C	C·G ^A	U·A ^U
G·C	G·C	G·C	G·C
Nequi	Tcele	Mther	Ssulf
UC	UC	UC	UC
U G	U G	U G	U G
C·G	G·C	U·A	A·U
U·A ^A	C·G ^G	C·G ^G	U·A ^C
G·C	G·C	G·C	G·C

The contribution of secondary structure



miRNAs - A little more detail



Emerging Field

- Databases are not as mature
 - Rfam, IncRNADB
 - Vega
 - miRBase and target databases
 - RNACentral

Worked Examples