

Engineering at the interface of RNA-protein complexes for solving difficult problems in biology and medicine



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What do Arctic foxes and drug-resistant bacteria have in common?



Summer Environment



Summer Environment

A challenge in fighting pathogenic bacteria

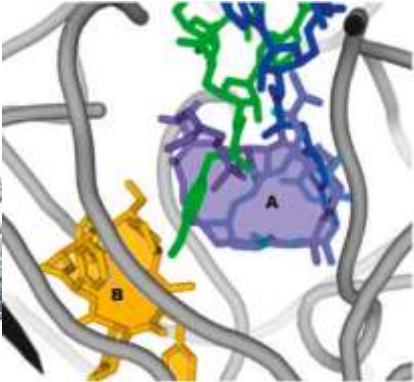
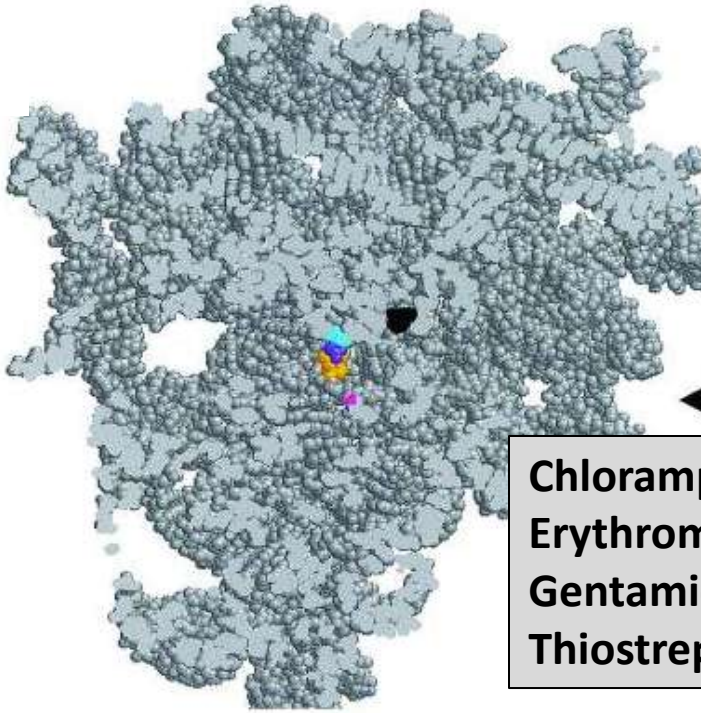
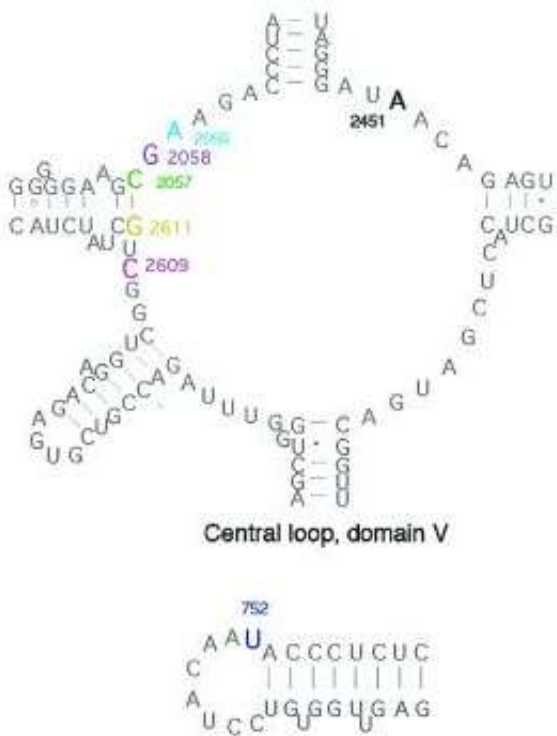


- Disease-causing microbes that have become resistant to antibiotic drug therapy are an increasing public health problem.
- ~ 70 percent of the bacteria that cause infections in hospitals are resistant to at least one of the drugs most commonly used for treatment.

RNA-protein complexes: key anti-bacterial targets

“Possibly the most pregnant recent development in molecular biology is the realization that the beginnings of life are closely associated with the interactions of proteins and nucleic acids” — [Florence O. Bell](#)

Example: Bacterial ribosome critical for survival (Nobel Prize, 2009)



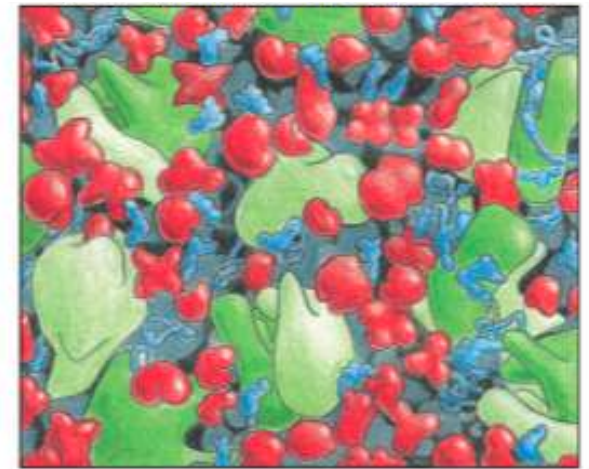
**Chloramphenicol,
Erythromycin, Neomycin,
Gentamicin Tetracycline,
Thiostrepton, Spiramycin...**

Molecular aspects of RNA-based recognition

Challenge: Understanding how to discriminate among all cellular molecules for **recognition of a specific target RNA**

- Structural and chemical features of RNAs that allow them to be recognized as drug targets?
- How do these interactions rearrange with environmental changes?
- How do they recognize their natural targets?

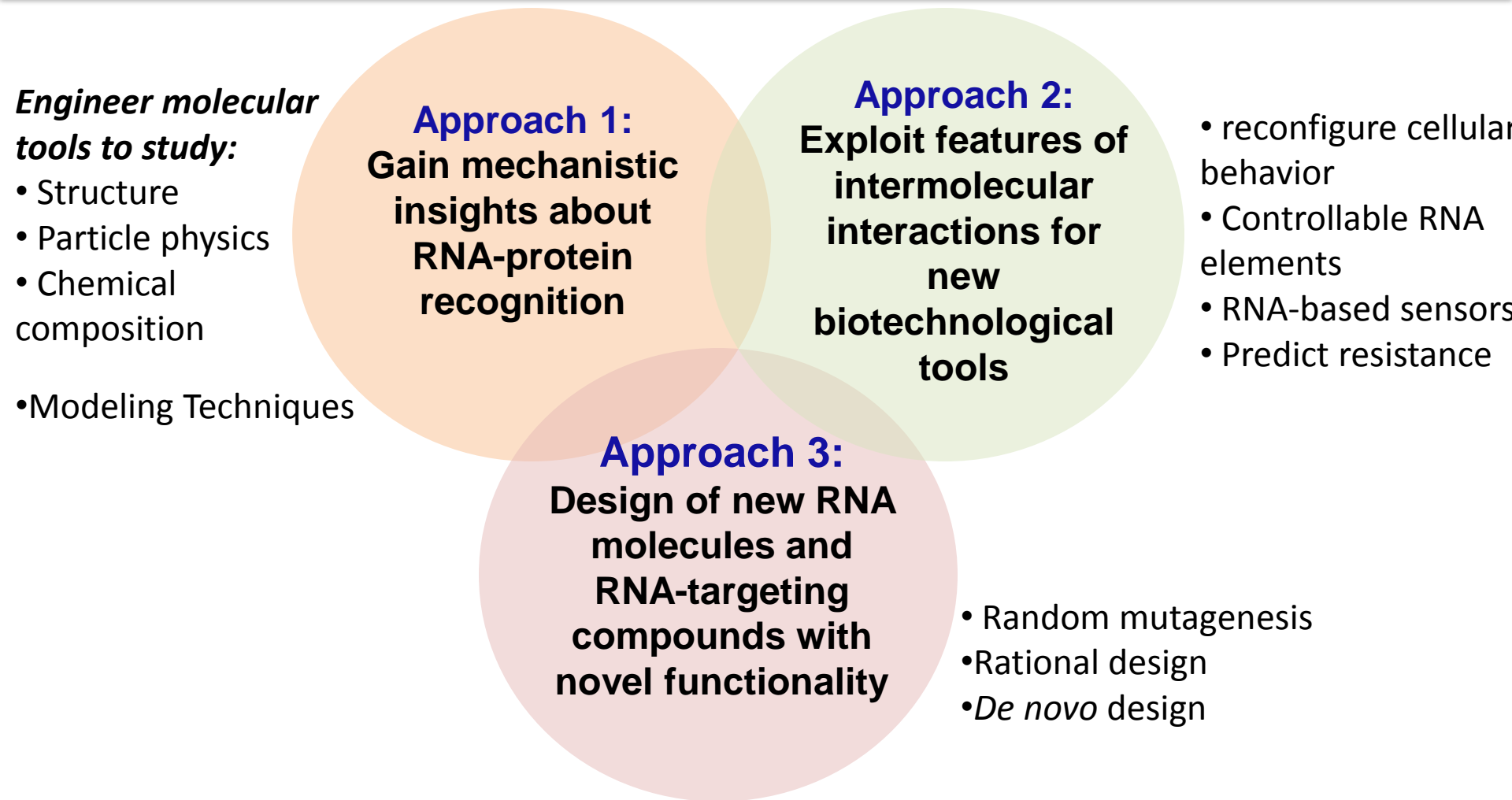
E. coli cytoplasm ~6mg/ml RNA



Engineering RNAs and RNA-targeting molecules with novel functionality

Can we exploit these sophisticated recognition methods for the design and development of new biotechnologically and therapeutically relevant RNAs?

Understanding and Engineering RNAs



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