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Although proponents of RNA might beg to differ, in the hierarchy of popular interest, DNA has historically held more sway. Being able to decipher genomes was seen as a milestone on the way to understanding life itself. What genome-wide RNA sequencing studies have revealed, however, is the unexpected complexity of RNA species encoded by DNA, most of which do not code for a protein. We now appreciate that such non-coding RNAs exert important regulatory controls on many biological processes.

The reviews in this Insight illustrate some of these principles. RNA is synthesized as a single-stranded molecule, but it is able to base-pair with itself, other RNA molecules or DNA. Hashim Al-Hashimi and colleagues discuss how secondary and tertiary structures of RNA are influenced by external cues to elicit a specific functional output. The cell exploits this dynamism to regulate processes such as transcription, post-transcriptional processing and translation. Jennifer Doudna and colleagues review a microbial adaptive immune system, CRISPR (clustered regularly interspaced short palindromic repeat). This system incorporates small pieces of invading viral or plasmid sequences into the bacterial genome as CRISPR loci; when future invasions occur, the expressed CRISPR RNAs recognize the foreign nucleic acids and mediate their degradation. The physiological function of many long non-coding RNAs remains undetermined, but Mitchell Guttman and John Rinn propose a model in which these molecules act in a modular fashion to bind different proteins or hybridize to various DNAs or RNAs; this modularity expands the scope of a single RNA's function. Finally, Amaia Lujambio and Scott Lowe highlight the role of another class of much shorter, non-coding RNA — microRNAs — in cancer development and suppression, and as a target for therapeutic intervention.

We hope these reviews provide a flavour of how the inherent properties of RNA make it a robust species to regulate cellular processes.

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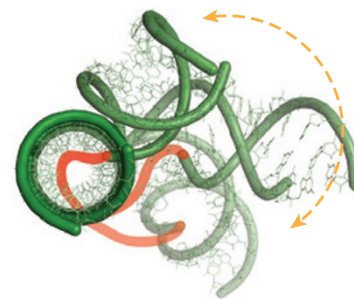
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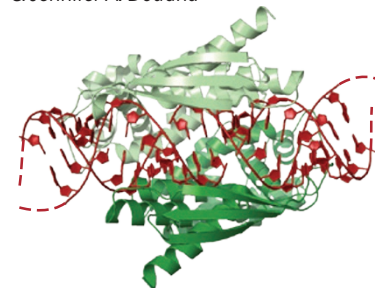
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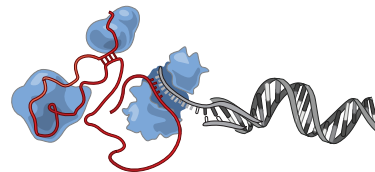
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