

nature insight

RNA



Cover illustration

Electron micrograph shows nascent pre-rRNA attached to its DNA template from a lysed yeast cell. (Image courtesy of Y. Osheim, K. Wehner, A. Beyer and S. Baserga.)

The DNA molecule, as the primary repository of genetic information in living systems, is constrained to be stable and predictably structured. RNA differs little from DNA in chemical terms, but by contrast contrives to exhibit remarkable conformational flexibility and functional versatility, playing the Oscar Wilde to DNA's Marquess of Queensberry. The past few decades of intensive research have revealed, for example, that RNA physically conveys and interprets the genetic blueprint of every living cell; it performs essential structural roles in a number of molecular machines; its ability to form transient duplexes allows it to work as a switch; and it is likely to work as an essential catalyst in several biologically important reactions.

This Insight comprises an eclectic series of articles on different facets of RNA chemistry and biology. The starting point, appropriately enough, is a discussion of the pivotal role that RNA seems to have played in the evolution of life on Earth, which likely accounts for its wide distribution in present-day organisms. The catalytic properties of RNA enzymes — ribozymes — are then surveyed, and the role of RNA in ribosome structure and function is described as perhaps the best understood example of an RNA-protein assemblage.

Moving gradually from chemistry into biology, eukaryotic pre-mRNA splicing is discussed in the context of how it contributes to the diversity of proteins and, ultimately, the cells and tissues they make up. Exciting recent work on RNA-based gene regulation is then described, hinting that much remains to be learned about the role of RNA in eukaryotic regulatory networks. Finally, current efforts towards the goal of using RNA molecules as therapeutic agents are reviewed.

Space constraints mean that many fascinating aspects of RNA structure and function have had to be omitted — the organization and behaviour of certain RNA viruses for one — but we nonetheless hope that readers will find the articles stimulating and enjoyable.

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