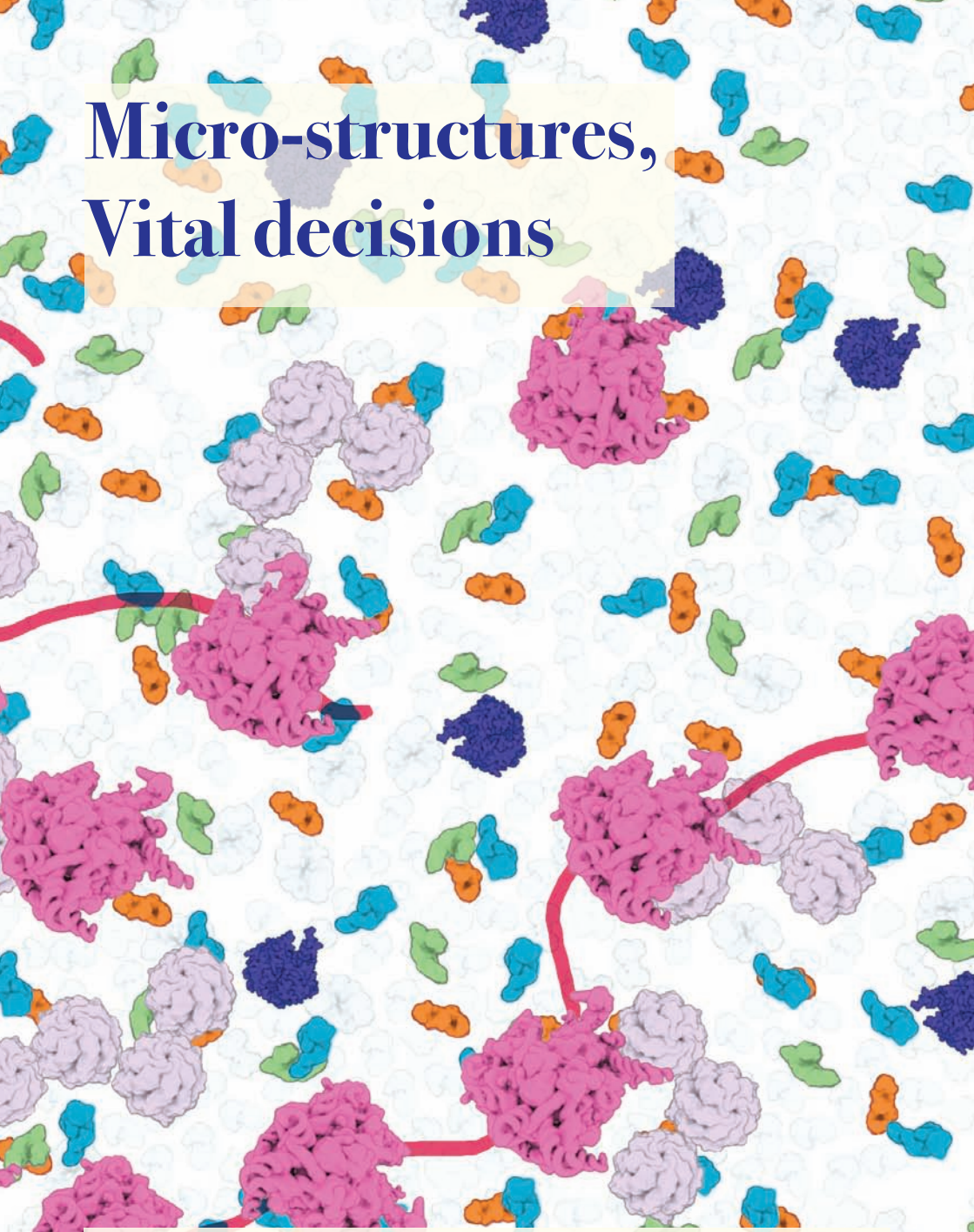
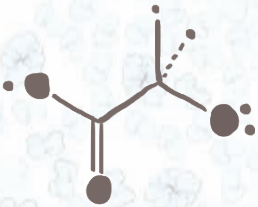
Micro-structures, Vital decisions

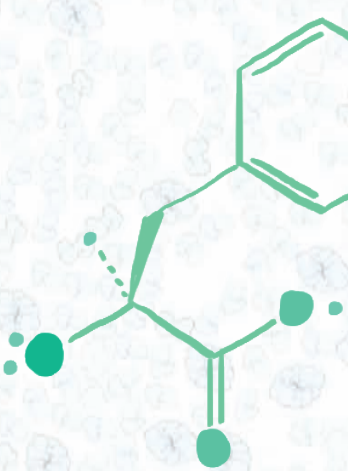


A cell is a crowded space,
a busy place where protein machines work incessantly.

This is a story of precision building of proteins by other proteins.

Introducing you to

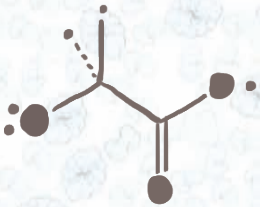


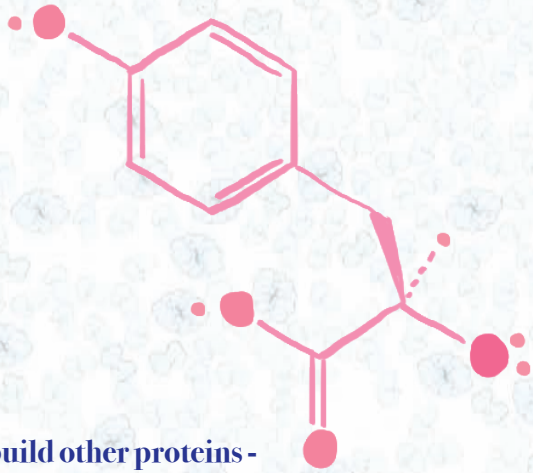


a clan of 20 amino acids used for building proteins,
each of them, except glycine, exist in two distinctly different mirror image forms of each other, called the D and L amino acids

mRNA - the design of proteins

tRNA - the carrier of amino acids to build proteins

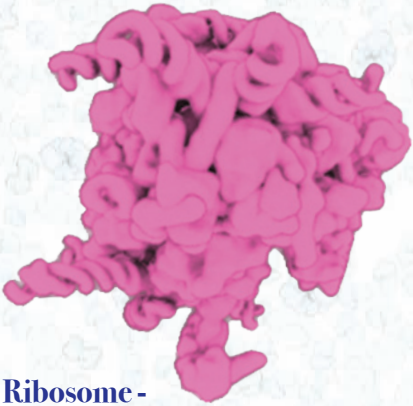




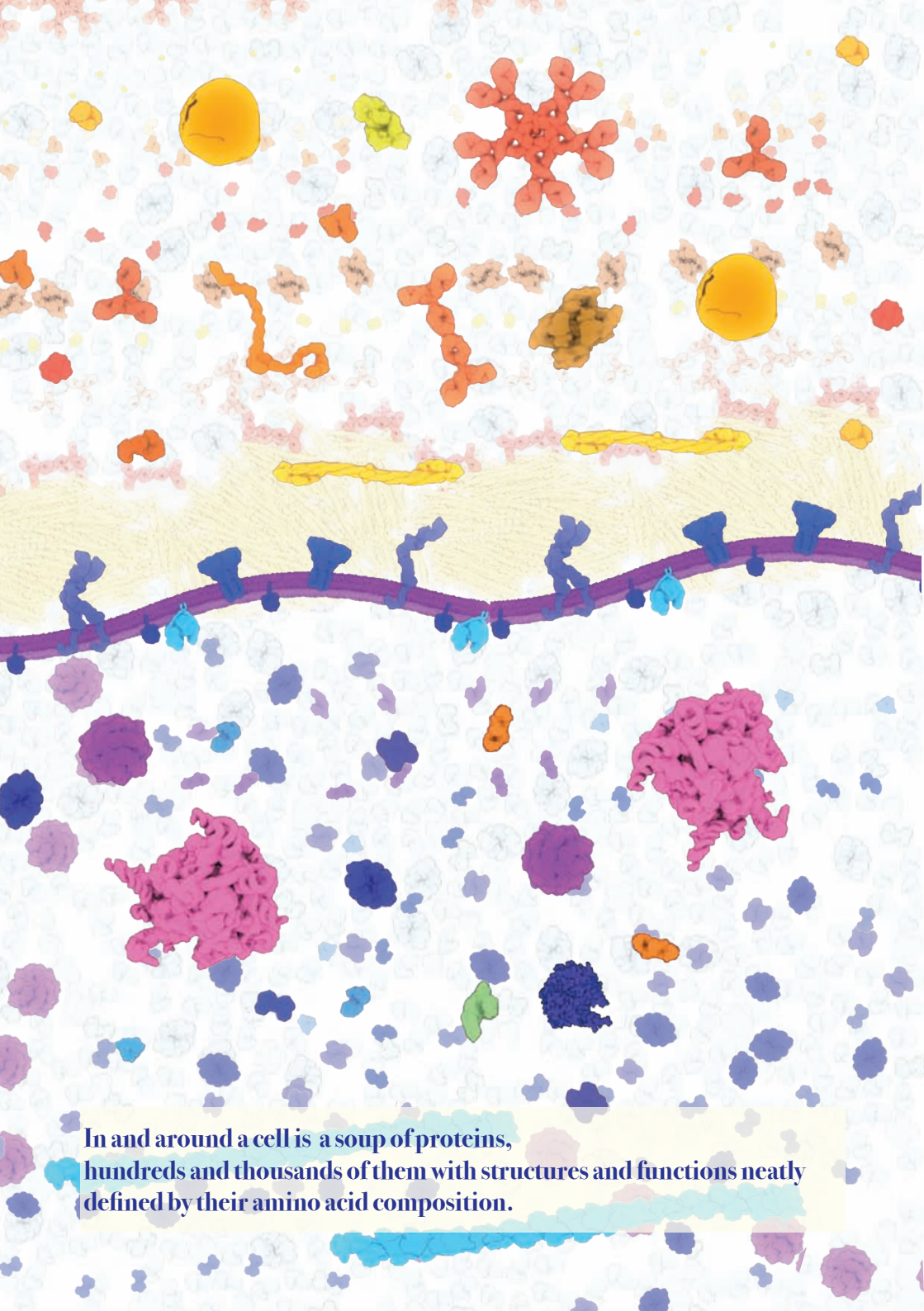
And bigger proteins that help build other proteins -

Aminoacyl tRNA synthetase - picks the right match of amino acid for its specific tRNA

EF-Tu - brings the amino acid bound tRNA to the ribosome

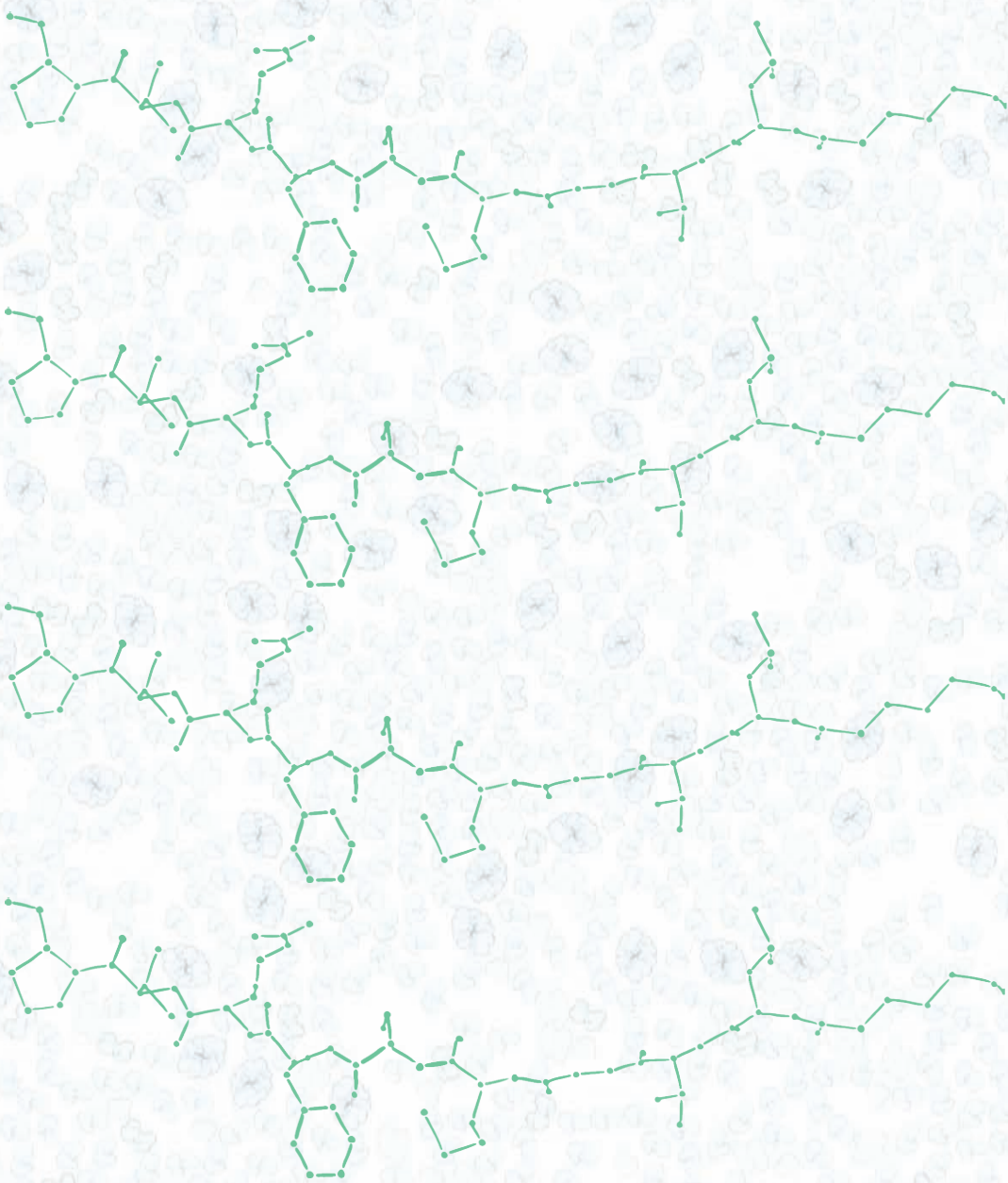


Ribosome - brings all of these together, and keeps adding amino acids, one at a time, in the sequence dictated by the design on the mRNA



In and around a cell is a soup of proteins, hundreds and thousands of them with structures and functions neatly defined by their amino acid composition.

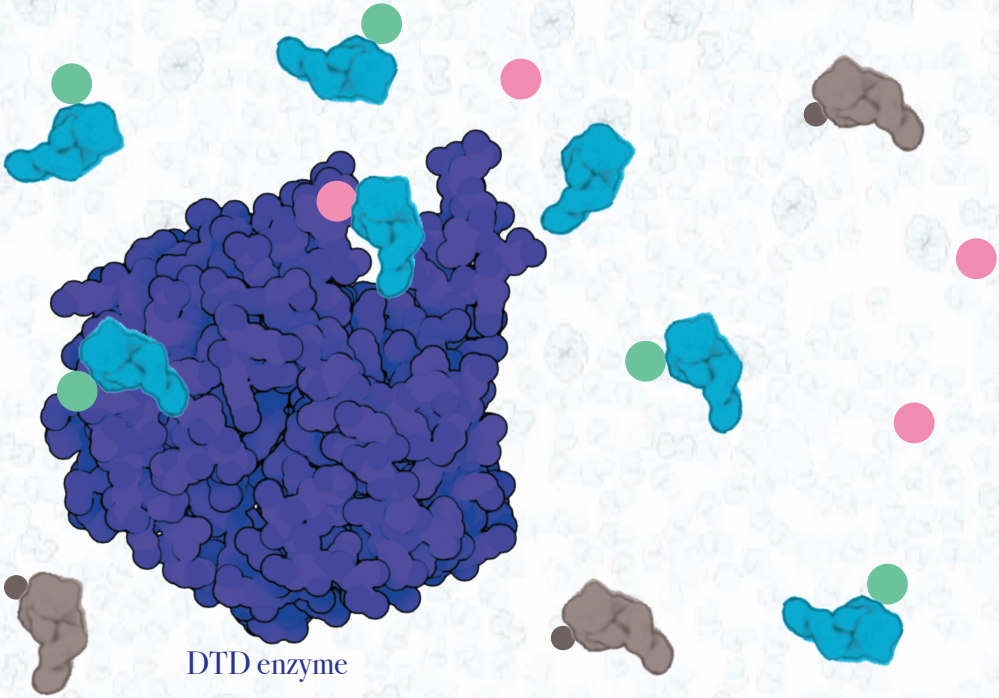
But each made of only L-amino acids.



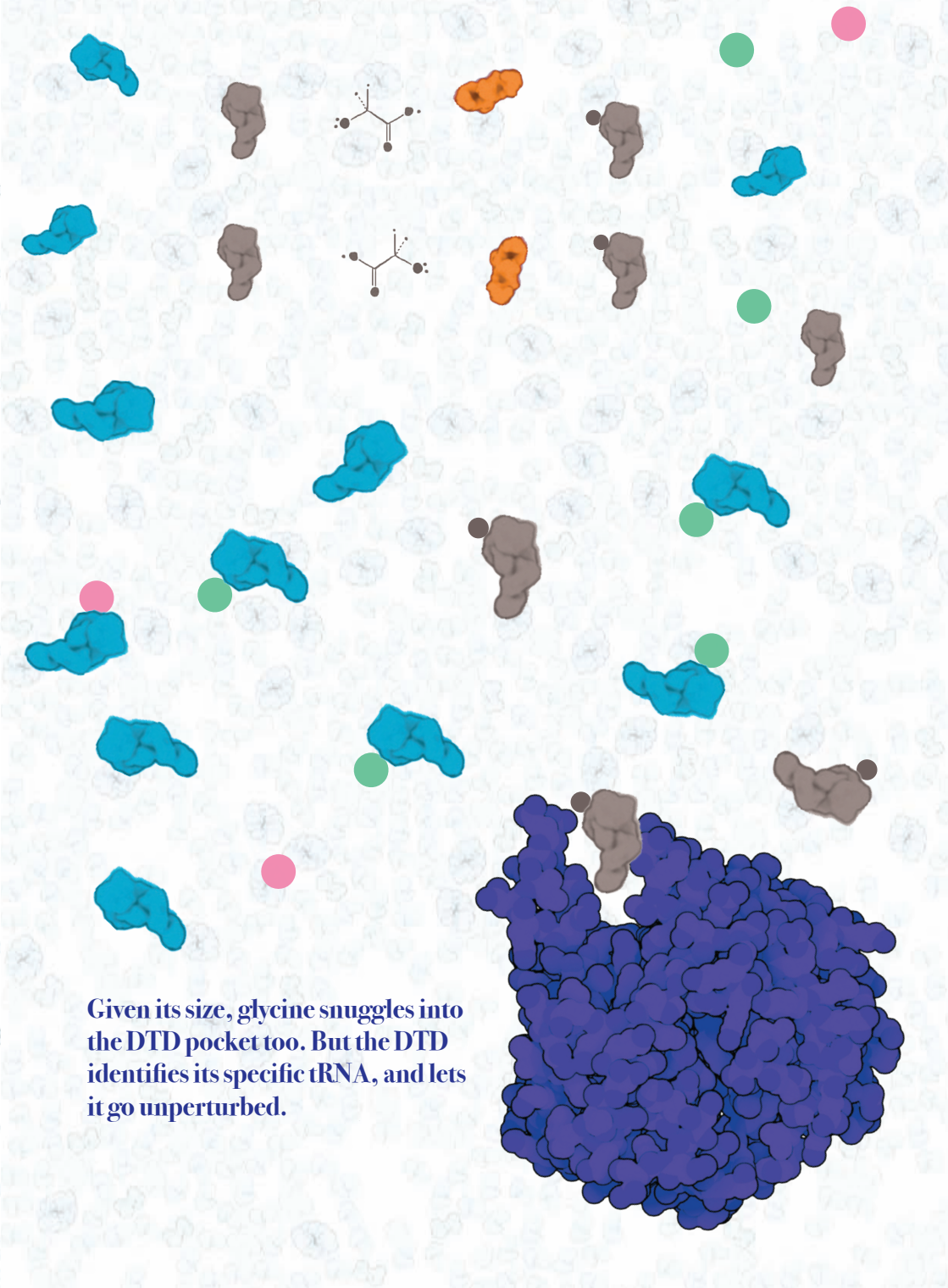
What stops the D-amino acids from building proteins?

A chopping machine with fine senses of micro-structures - DTD, does. D-amino acid bound tRNA has a structure different from L-amino acid bound tRNA.

The former fits into a specific pocket on the DTD, the latter doesn't. Anything that fits this pocket, gets cleaved with an exception of amino acid glycine bound tRNA.



DTD enzyme



Given its size, glycine snuggles into the DTD pocket too. But the DTD identifies its specific tRNA, and lets it go unperturbed.

DTD, a protein, made of L-amino acids is key to the process of ensuring an L-amino acid protein world. When it fails, life fails.

Would DTD choose differently had it been made of D-amino acids? Would life as we know look like its mirror image then with cells operating with D-amino acids?

CSIR - CCMB

Inspired by the research focus of
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