

The job of this mRNA is to carry the gene's message from the DNA out of the nucleus to a ribosome for production of a particular protein that this gene codes for. There can be several million ribosomes in a typical eukaryotic cell. These complex catalytic machines use the mRNA copy of the genetic information to assemble amino acid building blocks into the three dimensional proteins that are essential for life. Let's see how it works. The ribosome is composed of one large and one small subunit that assemble around the messenger RNA, which then passes through the ribosome like a computer tape. The amino acid building blocks (that's the small glowing red molecules) are carried into the ribosome attached to specific transfer RNA's (that's the larger green molecules also referred to as tRNA). The small subunit of the ribosome positions the mRNA so that it can be read in groups of 3 letters known as a codon. Each codon on the mRNA matches a corresponding anticodon on the base of a transfer RNA molecule. The larger subunit of the ribosome removes each amino acid and joins it onto the growing protein chain. As the mRNA is ratcheted through the ribosome the mRNA sequence is translated into an amino acid sequence. There are three locations inside the ribosome designated the A site, the P site, and the E site. The addition of each amino acid is a 3 step cycle. First, the tRNA enters the ribosome at the A site and is tested for codon-anticodon match with the mRNA. Next, provided there is a correct match, the tRNA is shifted to the P site and the amino acid it carries is added to the end of the amino acid chain. The mRNA is also ratcheted on 3 nucleotides, or 1 codon. Thirdly, the spent tRNA is moved to the E site and then ejected from the ribosome to be recycled. As the protein synthesis proceeds the finished chain emerges from the ribosome. It folds up into a precise shape determined by the exact order of amino acids. Thus the central dogma explains how the four letter DNA code is quite literally turned into flesh and blood.