

CYTOPLASMIC ORGANELLES Inside the cell membrane the fluid cytoplasm (or cytosol) bathes metabolically active structures called organelles, which may be membranous (such as mitochondria) or nonmembranous protein complexes (such as ribosomes and proteasomes). Ribosomes are macromolecular machines, about 20 x 30 nm in size, which assemble polypeptides from amino acids on molecules of transfer RNA (tRNA) in a sequence specified by mRNA. Oxygen, CO₂, electrolytic ions, low-molecular-weight substrates, metabolites, and waste products all diffuse through cytoplasm, either freely or bound to proteins, entering or leaving organelles where they are used or produced. Most organelles are positioned in the cytoplasm by movements along the polymers of the cytoskeleton, which also determines a cell's shape and motility. Cytosol also contains hundreds of enzymes, such as those of the glycolytic pathway, which produce building blocks for larger molecules and break down small molecules to liberate energy. The core of the small ribosomal subunit is a highly folded ribosomal RNA (rRNA) chain associated with more than 30 unique proteins; the core of the large subunit has three other rRNA molecules and nearly 50 other basic proteins. A functional ribosome has two subunits of different sizes bound to a strand of mRNA.