Cells as Factories

OUTLINE

I. A generic cell: factory analogy
II. Example: structure and function of muscle cells
    a. Actin and myosin (proteins): contractile machinery
    b. Sarcoplasmic reticulum: calcium release and uptake
    c. Mitochondria: sustained ATP production
III. Design of muscle cells by evolution
    a. Human biceps
    b. Flight muscles of migrating birds
    c. Rattlesnake tailshaker muscle

THE CELL FACTORY

What are the equivalents in the cell of the following in a manufacturing plant?

a. The building framework

b. Doors

c. Internal walls

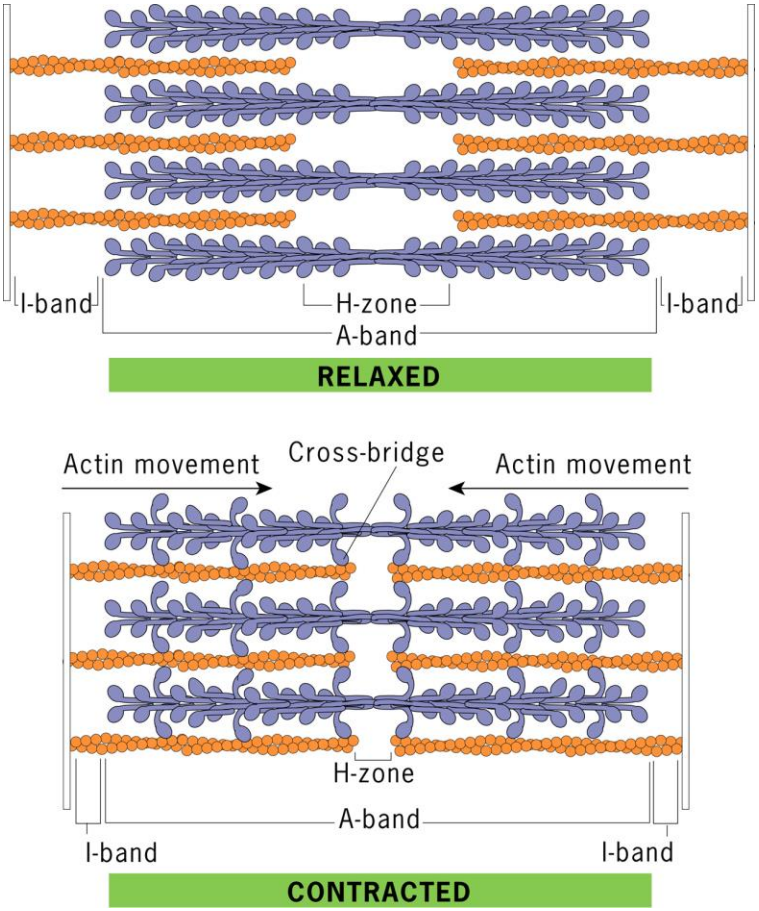
d. The machines that make products

e. The central computer

f. The central computer room (eukaryotic cells only)

g. The combustion engine

h. The solar cell (photosynthetic organisms)



[Figure from G. Karp, *Cell and Molecular Biology*]

MYOFIBRILS (= bundles of proteins within muscle cells)

to the tune of "My Sharona" by The Knack (1979)

Ooh my little filaments, filaments -- actin and myosin myofibrils:
Proteins that are long and dense, long and dense, making up the structure of the myofibrils.

CHORUS:
Signal from the brain rides the nerve to the muscle,
Where the myosin inside will slide past the actin of the my-my-my-y-y, woo!
Muh-muh-muh-myofibrils.

Add a little calcium, calcium to the cytoplasm near the myofibrils.
It will turn troponin on, troponin on, causing the contraction of the myofibrils.

CHORUS

Muscles need energy, energy, most of which is needed by the myofibrils.
Myosin burns ATP, ATP, fueling the contractions of the myofibrils.

CHORUS