Chapter 3
Biological Membranes

Abstract This chapter plays the role of an introduction to the subject of membranology. Here, we have gathered information and definitions regarding biological membranes that will subsequently become necessary. The principal purpose is to convince the reader that the available information on various origins is sufficient to reach the fully reasonable conclusion that the membranes can be viewed as two-dimensional surfaces in the three-dimensional Euclidean space and that the fundamental role in the shape of the membranes is played by the bending energy. The latter, in turn, is directly related to the membrane's curvatures. This chapter surveys a series of biological, physical and mechanical aspects that are fundamental as a foundation for our results. This chapter plays a supporting role for our further considerations. We have collected required notations and definitions related to biological membranes, which we will make use of later. For more information, the reader can see the cited literature.

3.1 Subject Matter and Biological Membranes

All organisms are made of the building blocks known as cells. However, some forms of life are made of only a single cell, such as the many species of bacteria and protozoa, while the others consist of vast numbers of cells—these are called multicellular.

The cell has all characteristics of the living systems: the ability to exchange substances and energy with the environment (and as a result, to grow, multiply and hand down hereditary information), to respond to external stimuli and to move about as needed. A cell is the smallest structural and functional unit of life.

The existing cells have different shapes. Many bacterial and unicellular organisms are spherical in shape. Animal epithelial cells are usually polyhedral. The spindle form was established in smooth muscle and extremely stretched plant fibers. The vascular cellular tissues of plants are tubular.

The term 'membrane' is used to denote the cell boundary, which is the barrier between the cell and the environment on one side, and the selective barrier that allows some things to pass through but stops others on the other side. The name

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