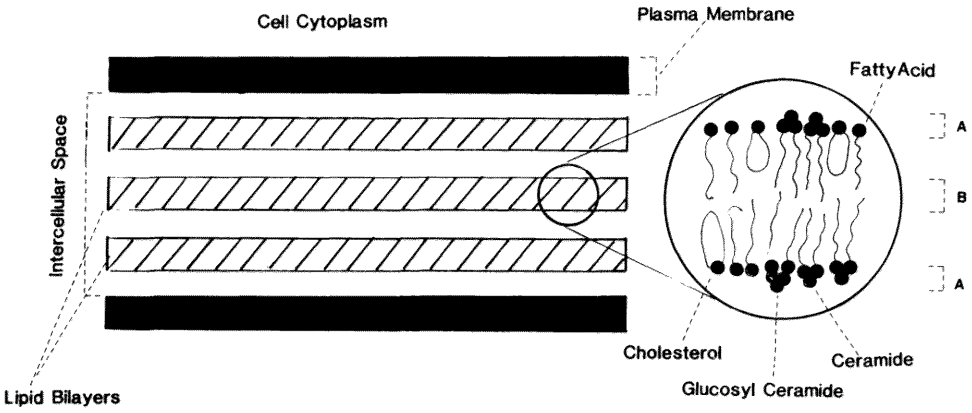

Figure 3.1 Layered structure of epidermal lipids as proposed by Elias (13).

meet. White (16) has recently made a very extensive x-ray investigation into the stratum corneum lipid structure, finding a layered structure only at high temperatures. At physiological temperatures solid phases were also present and the structure was complex.

Our discussion will be limited to the features of the layered structure, which are more complex than indicated by Figure 3.1. Low-angle x-ray diffractometry shows that in a model such as Elias' (13) not all of the lipids are positioned with their polar groups localized in the polar layer (see Fig. 3.1). Some of them are actually located in the region between the methyl groups. In addition, the low-angle x-ray diffraction patterns provide information with which to estimate penetration by water into the space between the lipid molecules. Order parameters of lipid groups by nuclear magnetic resonance (NMR) (17) are used to confirm the x-ray results and to provide information on the mobility of groups within the lipid molecules.

The results of low-angle x-ray diffraction and NMR, as well as their interpretation, are comparatively new to the dermatological constituency; therefore, the methods used and the interpretation of results will be briefly discussed.

A. Low-Angle X-Ray Diffraction

The low-angle x-ray diffraction pattern from a lamellar structure is unique and, at the same time, directly and unambiguously interpreted. A structure with alternating layers of electron-rich (polar