per headgroup. The method used to calculate the packing ratio uses Tanford's relations to calculate v and l_c as shown in the following (7):

$$v = (27.4 + 26.9n)\,A^3$$

$$l_c = (1.5 + 1.265n)\,A$$

where n is slightly less than the number of carbon atoms per amphiphile chain. Determination of a_o is accomplished by x-ray diffraction measurements on the lamellar liquid crystal.

Defined this way, the values for packing ratios related to the different structures are:

Structure	Ratio
Spherical micelles	$PR < 1/3$
Cylindrical micelles	$1/3 < PR < 1/2$
Bilayers (or vesicles)	$1/2 < PR < 1$
Inverted structures	$PR > 1$

The use of these principles can explain the transition of normal micelles, to bilayers, to inverted structures upon cosurfactant (octanol) addition. Ninham argues that a cosurfactant acts principally to increase the volume per surfactant molecule, without significantly affecting a_o or l_c (6). This is because the uncharged cosurfactant is able to pack between the ionic head groups without causing repulsion. Thus, as octanol is added to the normal micellar region, the packing ratio increases until it falls in the range of the lamellar liquid crystal, thereby implying that packing considerations find this association structure more favorable. Analogously, further addition of octanol increased the packing ratio toward and above unity, indicating that inverted structures are more favored.

To further investigate this idea, Friberg and Flaim (14) evaluated the packing ratio for a number of lamellar systems at their highest cosurfactant concentrations. For all systems studied, the packing ratio approached unity at that point at which the system entered into equilibrium with the inverted phase. Despite the simple geometric arguments used in the packing ratio concept, the method provides a straightforward, conceptual method of relating association structure formation to the physical characteristics of the component compounds. From these arguments, the phase progres-