Copy of a diagram referenced as "Sectioned diagram of the nuclear membrane. Diagrams from Professor Callan's EM. 33 publication"

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placed on the stage of a light microscope. This arrangement was now illuminated with a parallel beam of light from a mercury-arc lamp filtered through a monochromatic green filter and the resulting interference fringes observed with a low-power objective. From the displacement of the fringes where they cross the straight edge of the membrane the thickness of the dried membrane was estimated to be approximately 500 Å.

Taking the thickness of the membrane from interference measurements (which agree surprisingly well with estimates from shadow lengths) and taking figures for pore size and pore separation distance which are means between the measurements on supported and unsupported membranes, we are in a position to construct a sectional diagram of the nuclear membrane. Such a diagram is shown in figure 7.

Reconstructed sectional diagram of the nuclear membrane, the section passing through the diameters of the pores. The *a*-layer is shown black, with indentations at the points of mechanical weakness where breakdown gives rise to 'annuli'. The *b*-layer is shown cross-hatched. The shape of the structural units of the *a*-layer is inferred only. The relative magnitudes of layer thickness, pore diameter and separation distance between pore centres have been directly determined. (Magn. × 500,000.)

4. Discussion

There can be little doubt, from the evidence presented in the foregoing account, that the nuclear membrane of amphibian oocytes is a dual structure. The results of three different kinds of experiment agree in demonstrating that the two surfaces of the membrane are different in character. The external surface is porous; the evidence that this porous structure is not merely an artefact has been presented on p. 372. The internal surface gives no indication of heterogeneity of texture; it is the surface of a discrete layer which can exist in the absence of the external porous material.

At first sight it might be imagined that the thicker porous *a*-layer acts as a mechanical support for the thinner structureless *b*-layer. It seems probable that the *b*-layer determines the permeability properties of the nuclear membrane; the actual pores through which penetrating molecules pass the membrane must be well outside the limits of resolution of the electron microscope, since such molecules as egg and bovine plasma albumin, glycogen and gum acacia are unable to penetra