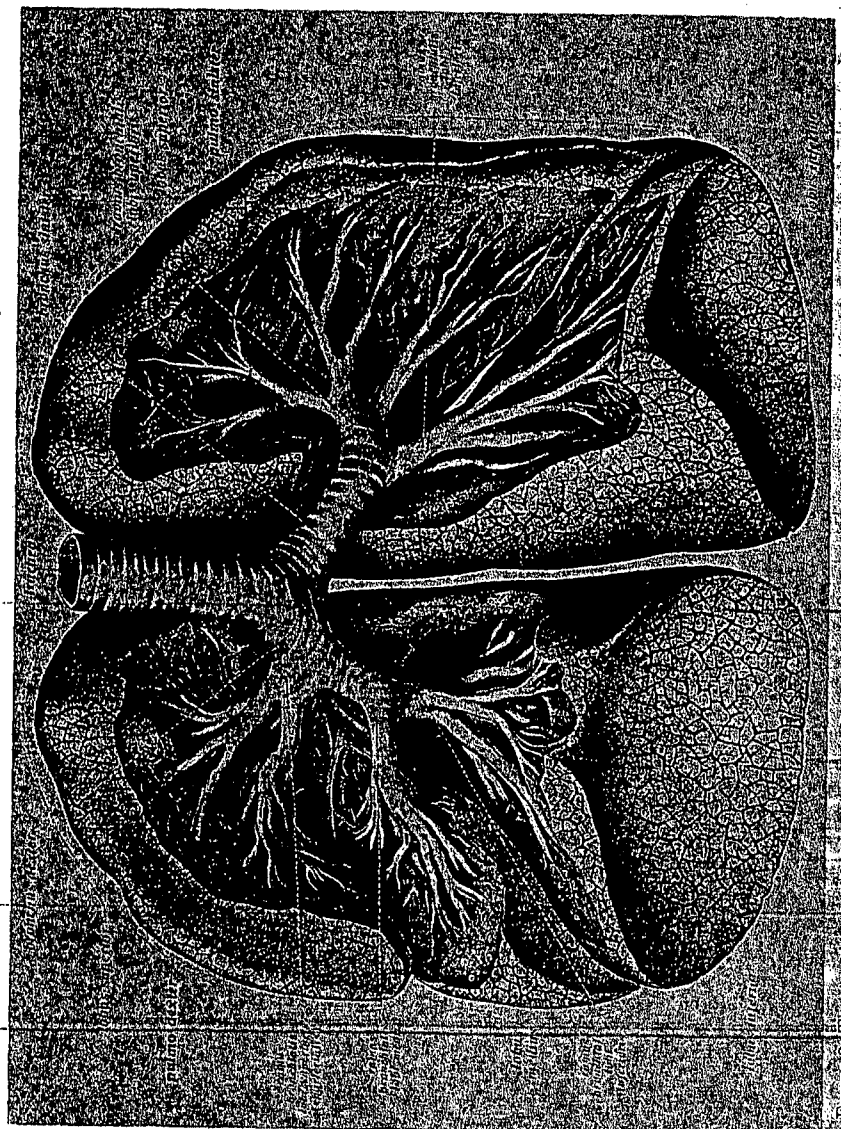

The terminal bronchioles are the last of a series of subdivisions of these nonrespiratory bronchioles. The muscular tissue in their walls is more highly developed than that in any other part of the bronchial tree and when fully contracted exerts a sphincterlike action which can completely shut off the air supply to the chambers beyond.

The structures lying distal to the terminal bronchioles are the "leaves" of the bronchial tree. They have a respiratory function: the interchange of gases between air and blood occurs through their walls. The respiratory portion consists of the respiratory bronchioles, alveolar ducts, alveolar sacs, and pulmonary alveoli. The cluster formed by a related group of these structures constitutes a *lung unit* or *primary lobule*. This is the distensible or bellows part of the lung.

The *respiratory bronchiole* as described by Best and Taylor[9] has the same diameter as the terminal bronchiole, of which it appears as a branch or a continuation. Five or six *alveolar ducts* arise from each respiratory bronchiole. After a variable number of rebranchings each alveolar duct gives rise to from three to six dilatations, the *alveolar sacs*. The bays in the walls of these sacs constitute the *pulmonary alveoli*, which are lined by a single layer of flattened epithelial cells cemented together. The alveolar walls contain elastic fibers and a rich network of capillaries. Frequently only a single capillary channel intervenes between the walls of adjacent alveoli. The blood in the capillaries is therefore separated from the air in the alveoli by only two membranes of the utmost delicacy—the alveolar and capillary walls, so the greatest freedom is afforded for the diffusion of gases from the blood to the alveolar air and from the alveolar air to the blood.

The bronchioles, as they approach the periphery of the lung, branch and rebranch repeatedly, diminishing in length with each subdivision. The first branchings are about 1.5 mm. in length and from 0.3 to 0.4 mm. in diameter. The terminal and respiratory bronchioles are from 0.2 to 0.5 mm. in length but of about the same diameter as the more central subdivisions. That is, the bronchioles, though progressively shorter, show practically no decrease in diameter as they pass toward the periphery. The alveolar sac, however, is considerably wider than either the respiratory bronchiole or the alveolar duct from which it arises. The pulmonary alveoli are semiglobular and have diameters ranging from 0.075 to 0.125 mm.; the total number in the lungs has been estimated by Zuntz at 750 million. Willson[10] estimates the total epithelial surface of the lungs at 70 sq. meters; of this, probably 55 sq. meters, over 25 times the surface area of the skin, is respiratory.

From these facts it is apparent that lung tissue offers by far the best medium of any in the body for the absorption of materials that may come in contact with it.

5. Blood vessels and lymphatics. Except in the alveolar areas the blood vessels and lymphatics follow rather closely the path of the bronchial tree. The relationship in the periphery of the lung is shown clearly in Figure 3.[11]

[9] C. H. Best and N. B. Taylor, *The Physiological Basis of Medical Practice*. 3rd ed., Williams & Wilkins, Baltimore, 1943.

[10] H. G. Willson, *Am. J. Anat.*, **30**, 267 (1922).

[11] W. S. Miller, as reproduced by Pendergrass in A. J. Lanza, ed., *Silicosis and Asbestosis*. Oxford Univ. Press, New York, 1938.