*** syrinx ***

Songbirds produce sounds whose volume and duration transcend the small size of the singers. Understanding the anatomy and physiology of the structures which birds use for vocalization explains how such sound can be generated.

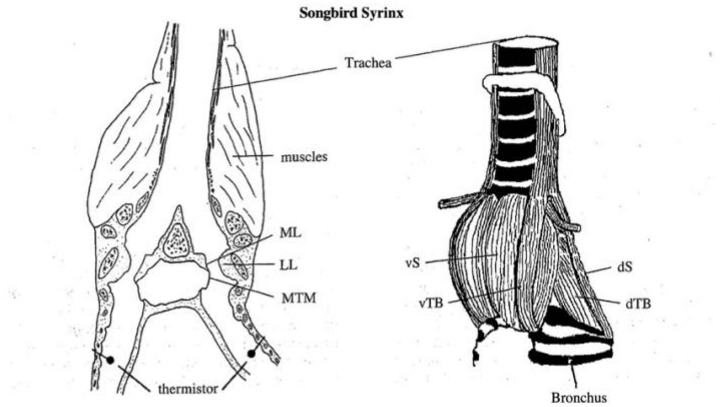


Figure 9.2 A songbird syrinx showing its bipartite structure with 2 sound generators and multiple pairs of muscles. On the left is a frontal section through a brown thrasher syrinx showing the location of microbead thermistors used to sense airflow through each side. The medial and lateral labia form pneumatic valves at the cranial end of each bronchus and oscillate to produce sound. On the right is a ventrolateral view of the same syrinx depicting the syringeal muscles. vS, ventral syringeal muscle; vTB, ventral tracheobronchialis muscle; dS, dorsal syringeal muscle; dTB dorsal tracheobronchialis muscle.

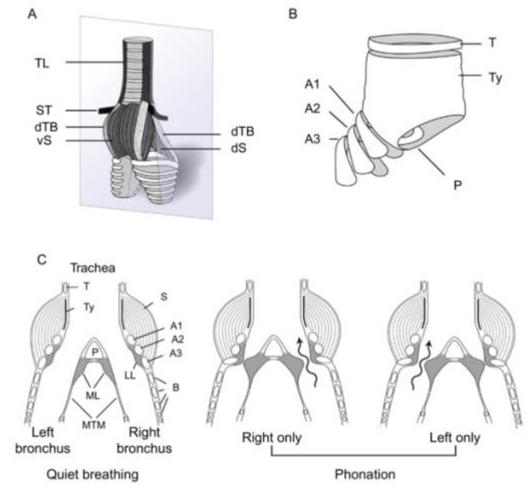


FIGURE 3.
Anatomy of the songbird syrinx and phonatory mechanism. (A) Ventrolateral external view of a thrasher syrinx depicting syringeal muscles. (B) Cartilage components of the syrinx include three tracheo-bronchial semi-rings (A1–A3)

In humans, vibrations of vocal cords by air flowing out from the lungs produce the sound used for speaking and for song. Birds do not have vocal cords, but instead have a complex structure, the **syrinx**, located where bronchi meet to form the trachea. This is where membrane vibrations occur to form sound and where modulations and resonations deliver birdsong.

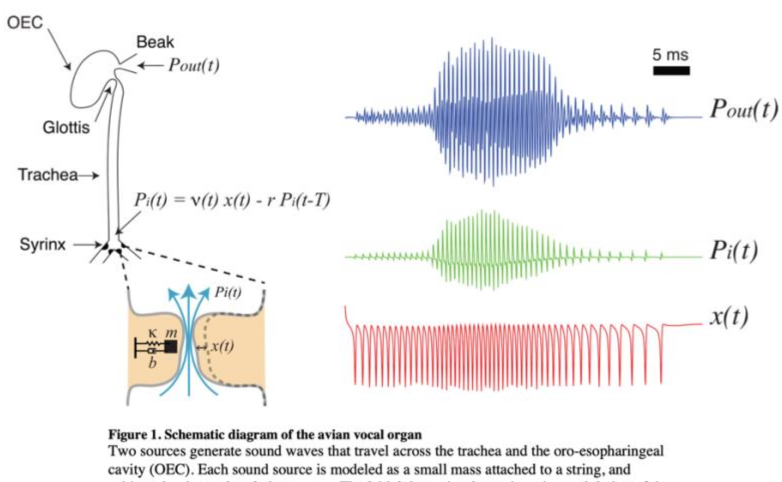
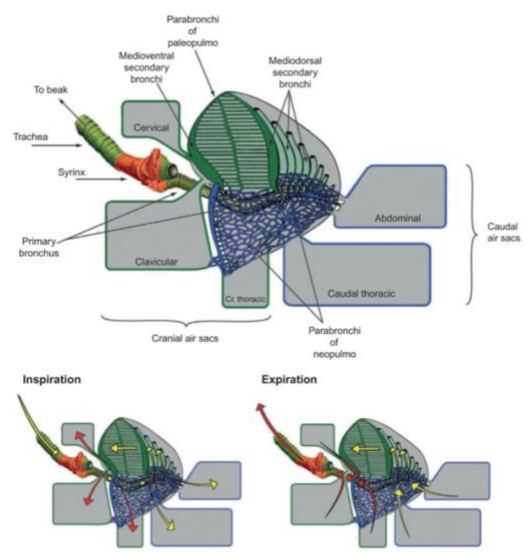
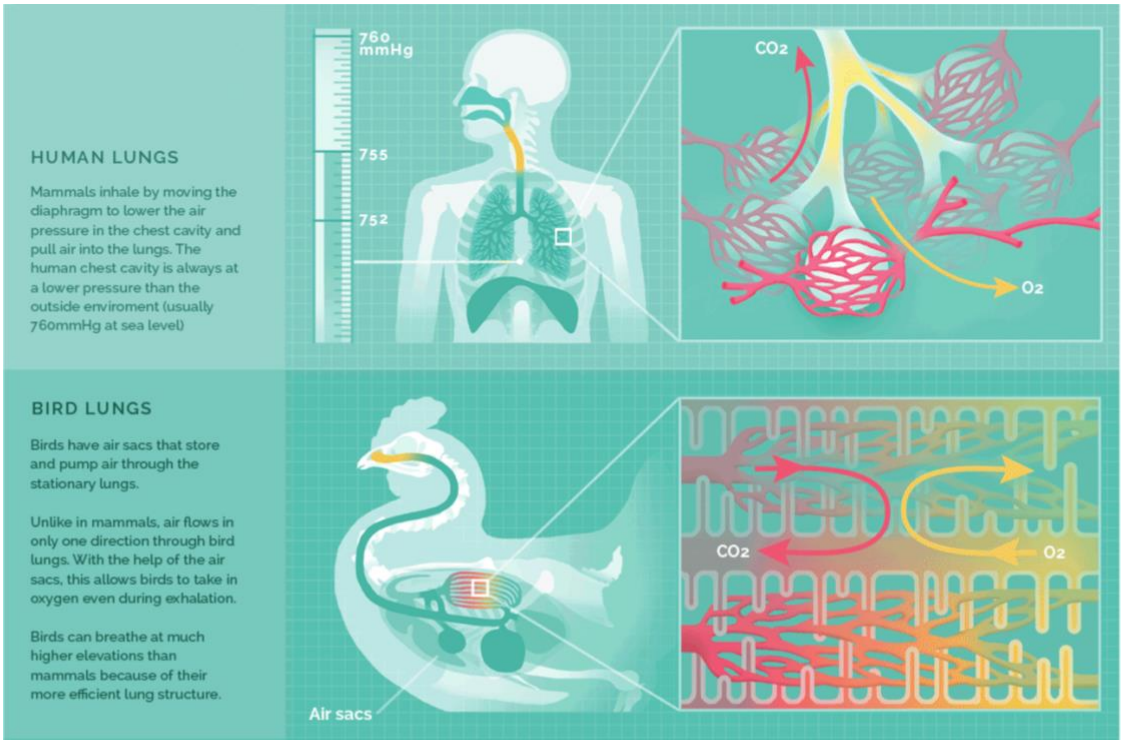


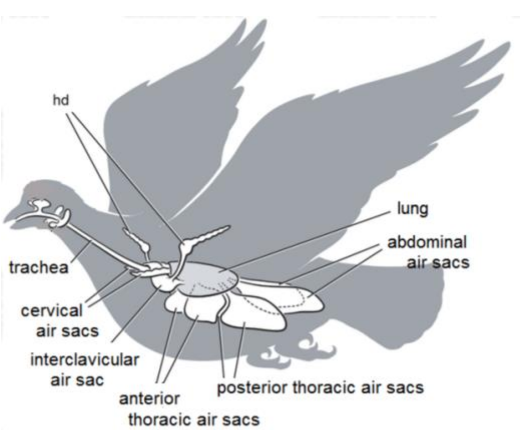
Figure 1. Schematic diagram of the avian vocal organ
Two sources generate sound waves that travel across the trachea and the oro-esopharingeal cavity (OEC). Each sound source is modeled as a small mass attached to a string, and subjected to inter-glottal air pressure. The labial dynamics determines the modulation of the airflow. The simulated labial position, pressure at the input of the trachea, and output pressure are illustrated (right).



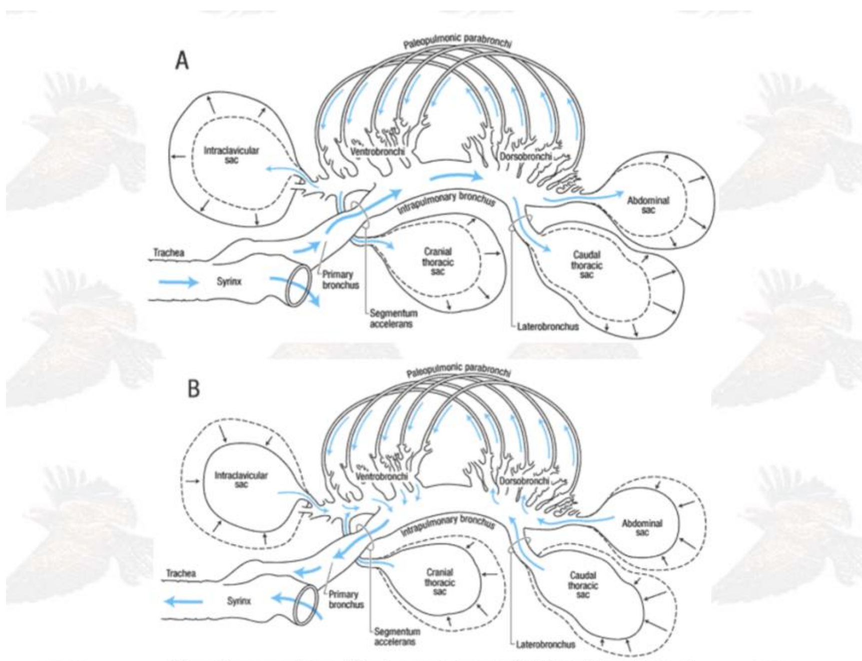
There is then the question of how such a small creature with small lungs sustains prolonged melodies, unbroken by the need to inhale. As it turns out, the respiratory system and airflow in birds is markedly different than that in humans or other mammals.



With ability to maintain constant unidirectional airflow across the **syrinx**, sustained song is possible.



Avian respiratory system



Schematic representation of the lungs and air sacs of a bird and the pathway of gas flow through the pulmonary system during inspiration and expiration. For purposes of clarity, the neopulmonic lung is not shown. The intrapulmonary bronchus is also known as the mesobronchus. A - Inspiration. B - Expiration
Source: http://www.ivis.org/advances/Anesthesia_Gleed/ludders2/chapter_frm.asp

[*syrinx*] page on **[imagessays.com]**