(ii) Phloem tissue or bast or Leptome:

- The term phloem was coined by **Nageli** (1858).

▪ Phloem is another type of **conducting** tissue like xylem which is responsible for conduction of **organic** substances.

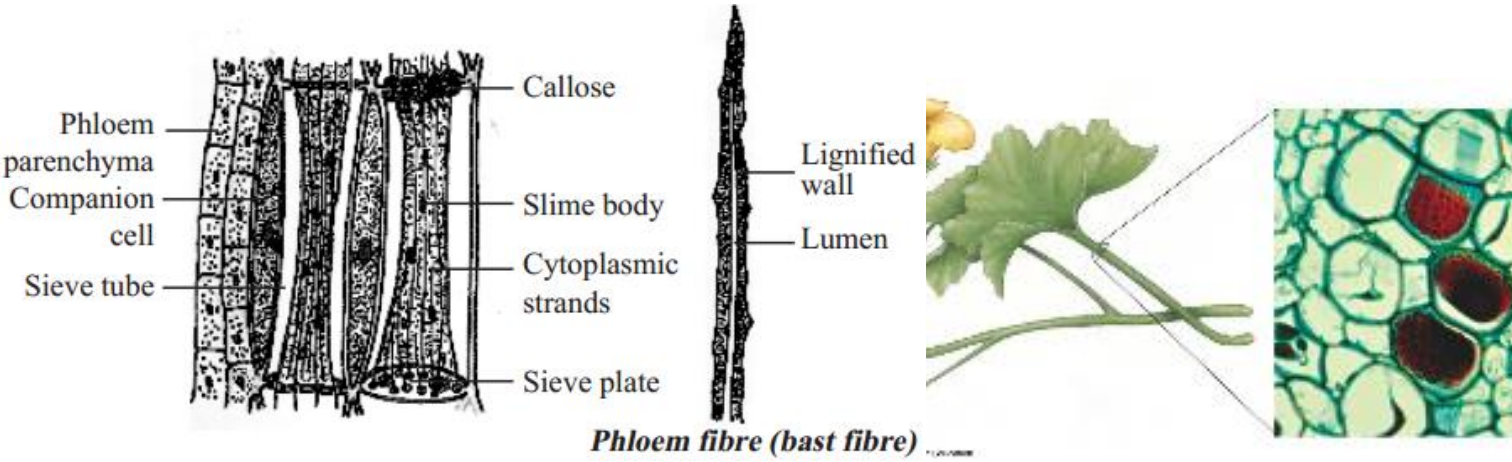
▪ The phloem from the **procambium** is called ***primary*** phloem and that formed from **vascular cambium** is called ***secondary*** phloem.

▪ Phloem composed of **four** elements: **Sieve tube elements, Companion cells, Phloem parenchyma** (Bast parenchyma) and **Phloem fibers** (Bast fibers)

The phloem tissue is very concentrated in **sugars, amino acids, and many nutrients.** It is the phloem that **sucking** insect in order to **feed** on the sugar and nutrients... This is similar to a **mosquito** piercing your veins and arteries as a food source.

(1) **Sieve tube elements:** Sieve tubes are **tube**-like structures, composed of **elongated** cells, arranged in **longitudinal** series and associated with **companion** cells. Their walls are **thin** and made of cellulose. In a **mature** sieve tube the nucleus is **absent** but cytoplasm as well as large vacuole is present. Although **without** nucleus, it is **living** and the nucleus of the **companion** cells controls its functional activities. The **transverse** partition walls are **perforated** by a number of pores, giving the appearance of **sieves**. They are called the **sieve plates**. At the **end** of the growing season the sieve plate is covered by a deposit of **carbohydrate** called **callose**. But in the **spring**, when the active season begins, it gets **dissolved**; in **old** sieve tubes callose forms a permanent deposit. The conduction of food materials takes place through **cytoplasmic** strands. They are distinguished into **sieve cells** and **sieve tubes**. Sieve **cells** occur in **pteridophytes** and **gymnosperms**, while sieve **tubes** occur in **angiosperms**. Sieve cells have are not associated with companion cells whereas Sieve tubes are associated with the companion cells.

Functions: Transport of **prepared** food materials from **leaves** to the storage **organs** in the downward direction and then to **growing** regions in the upward direction.



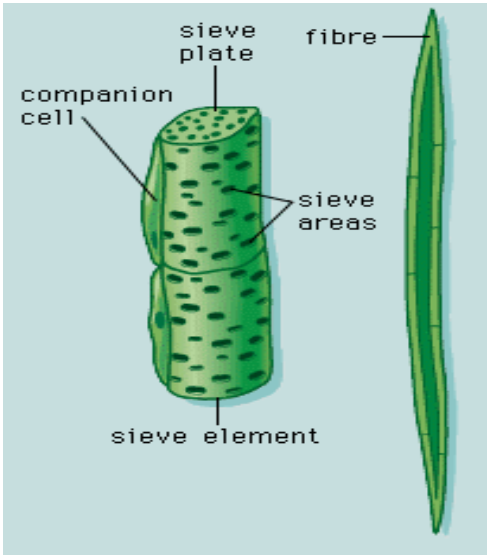
(2) Companion cells: These are **specialized** parenchyma cells which are **closely** associated with the **sieve** tube elements in their **origin, position and function**. These **originate** from the **same meristematic** cells that give rise to the **sieve** tube elements. The companion cell has **dense** cytoplasm and **prominent** nucleus. The nucleus **controls** the metabolic activities of the **sieve** tube. They are **connected** to the sieve tubes through **pits** found in the **lateral** walls. The companion cells are present **only** in **angiosperms** and **absent** in **gymnosperms** and **pteridophytes**.

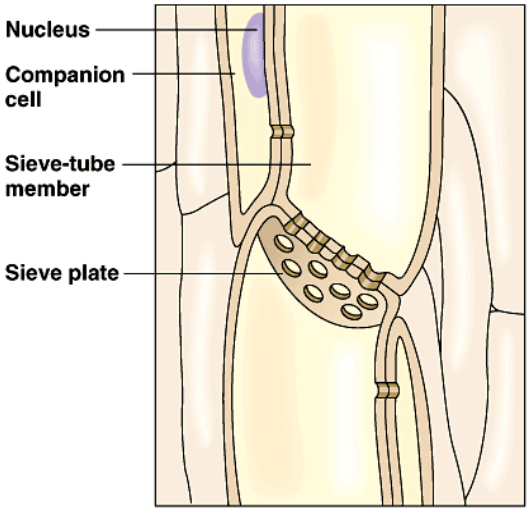
(3)Phloem parenchyma (Bast parenchyma): these are **living** parenchymatous cells. The cells have **dense** cytoplasm and **nucleus**. The cell-wall is composed of cellulose and has **pits** through which **plasmodesmatal** connections exist between the cells. They **store** starch and fats. They are present in **all**, **pteridophytes**, **gymnosperms** and **dicots**. In **monocots**, usually phloem parenchyma is **absent**.

(4) Phloem fibers (Bast fibers):

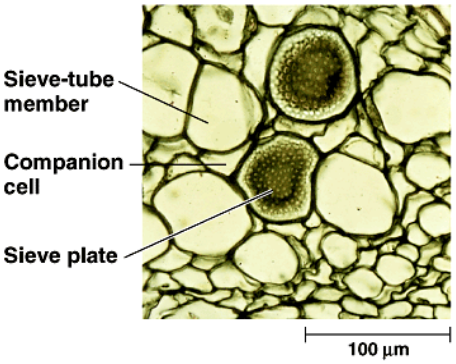
These are much **elongated**, **unbranched** and have **pointed**, **needle**-like apices. Their cell wall is quite **thick** with simple or slightly **bordered** pits. At maturity these fibers lose their **protoplast** and become **dead**.

Functions:



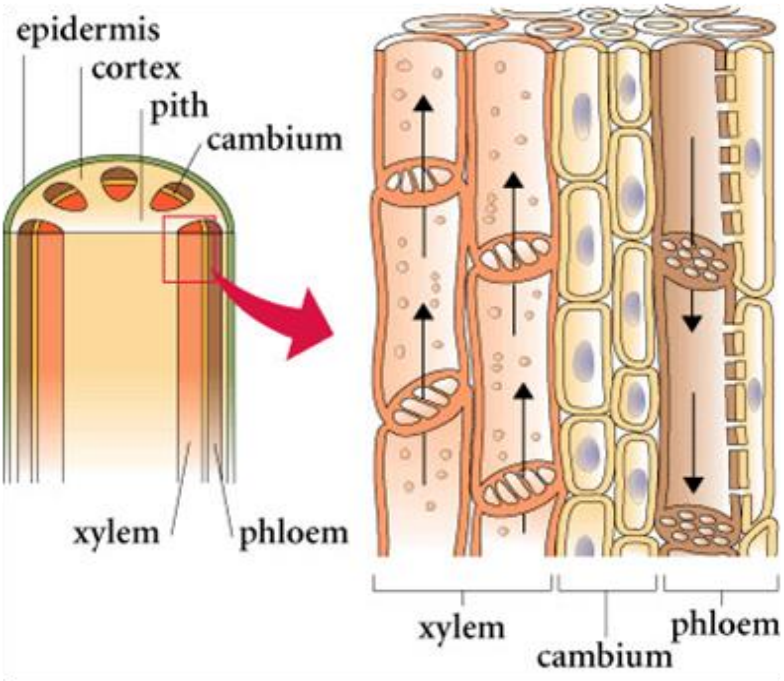


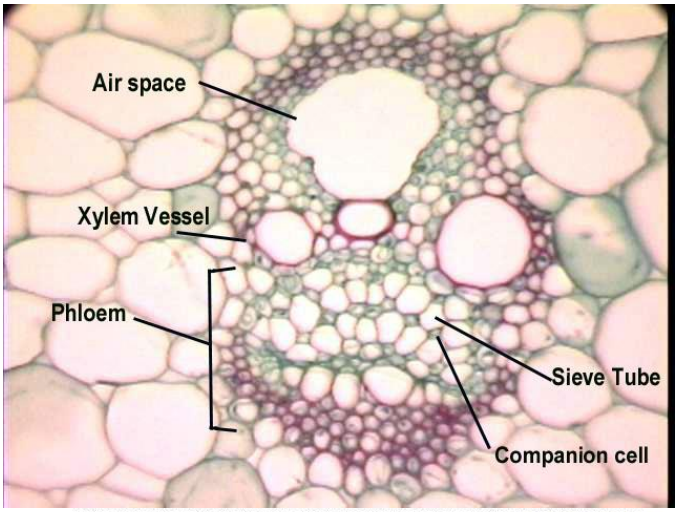
(a) Longitudinal view

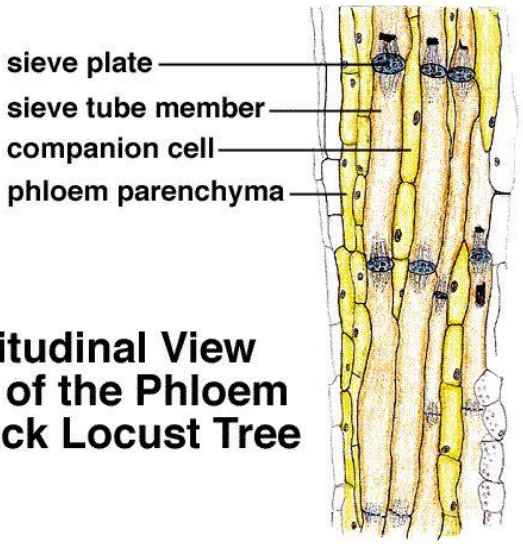


(b) Transverse section (LM)

The phloem fibers provide **mechanical** support to the phloem. The phloem fibers are **economically** very important.







Longitudinal View of Part of the Phloem of a Black Locust Tree