

Properties of Matrix  $L$ :

$$L = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.5 & 0.5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0.25 & 0 & 0 & 0 \end{bmatrix}$$

$$M = \begin{bmatrix} m_1 \\ m_2 \\ m_3 \\ m_4 \\ m_5 \\ m_6 \end{bmatrix}$$

$(L)_{41}$   
↑

$(L)_{61} \Rightarrow$  fraction of  $m_1$  in  $u_6$   
 $m_1$  comes from either father 4 or mother 5

$$u_4 = \frac{1}{2}m_1 + \frac{1}{2}m_2 + m_4$$

$(L)_{51}$

$$(L)_{42} = 0.5 = \frac{1}{2}[(L)_{11} + (L)_{21}] \Rightarrow \frac{1}{2}[(L)_{51} + \frac{1}{2}(L)_{41}]$$

fraction of  $m_2$  in  $u_4$

where animals 1 and 2 are parents of animal 4

In general:  $(L)_{ij}$  which is the element in row  $i$  and column  $j$   
( $i > j$ ) meaning the lower diagonal of  $L$

$$(L)_{ij} = \frac{1}{2}(L)_{sj} + \frac{1}{2}(L)_{dj}$$

where  $s$  and  $d$  are parents of  $i$