A *cellular leaf* is a general planar framework formed by dissecting a simple polygon with vertices and edges such that the interior faces are triangles and parallelograms, with the possibility of cross braces in the parallelograms. Our central theorem states that a cellular leaf is rigid if and only if its associated zone graph is connected. This extends the results of Bolker and Crapo for grids formed by a parallelogram decomposed into parallelograms.

We will demonstrate the correspondence between motions of a cellular leaf and motions of an associated much simpler framework called the *zone star*, developed from the zone graph. Moreover, from the construction of a zone star, we know that a zone star of a cellular leaf is flexible if and only if its associated zone graph is disconnected. Moreover, given a disconnected zone star $\vec{z}_{L(p)}$, any continuous motion $m(t)$, altering directions or lengths of a disconnected component, will result in a new zone star $\vec{z}_{L(m(t))}$ yielding a new cellular leaf $L(m(t))$, captured by $m(t)$. Thus, the zone star becomes a vital geometric and combinatorial tool for tracking all possible motions in any cellular leaf. (Received October 03, 2004)