

Expanded View Figures

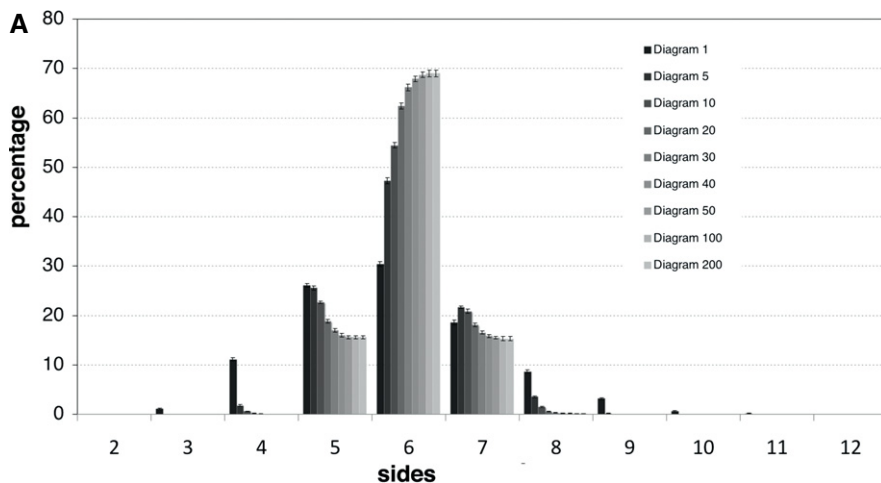
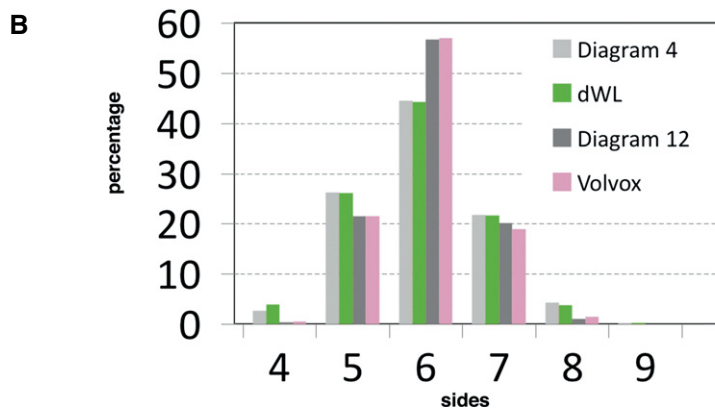


Figure EV1. Polygon distribution for CVT diagrams from 1 to 200, dWL and Volvox images.

A Comparison of the different polygon distributions along the CVT path. The number of hexagons never reached more than 70% of the total number of cells. Data are represented as mean \pm SEM. All diagrams: 20 replicates.

B Volvox is a green alga that forms spherical colonies. We compared the data obtained from Korn and Spalding (1973) with the different CVT diagrams. The Volvox polygon distribution was very similar to a Voronoi Diagram 12. *Drosophila* larva wing disc epithelium (dWL) polygon distribution was very similar to the one for Diagram 4.



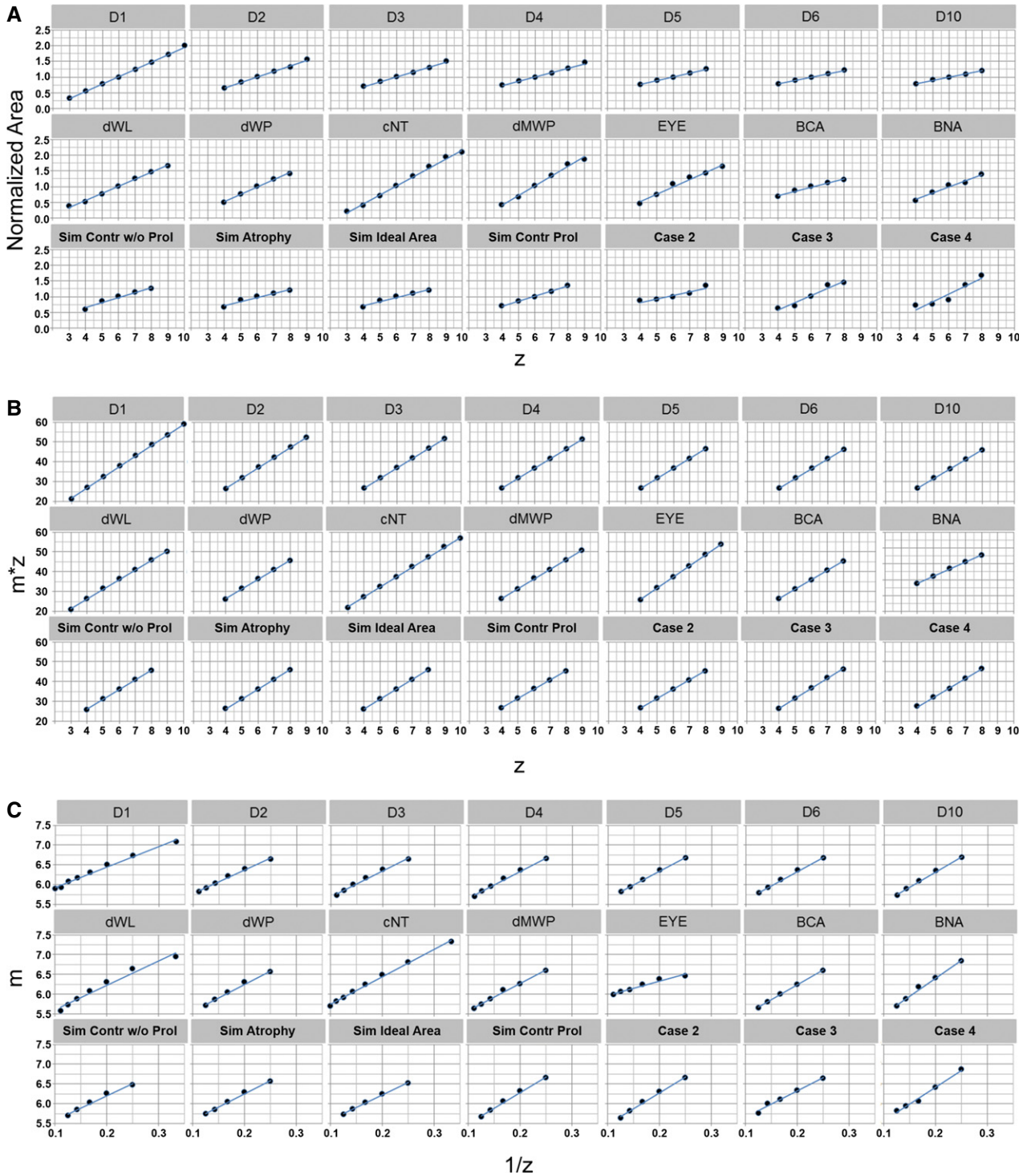


Figure EV2. Analysed packed tissues largely hold to several geometrical laws.

- A Lewis' law. All samples show a linear relationship between cell area and the number of cell sides (z). Each solid point represents an average of cell areas across all samples. Blue lines show a linear fit to the data.
- B Aboav–Weaire law. All samples show a linear relationship between the number of cell sides (z) and the product of this quantity with the average number of sides of a cell's neighbour (m). This demonstrates that all samples follow the predicted trend.
- C To see whether there are any minor deviations from the Aboav–Weaire law, we plotted the inverse of the number of cell sides ($1/z$) against m . The slight curvature in the profiles demonstrates that there is in fact a minor deviation for most samples, which is consistent with previous studies of random Voronoi tessellations (Hilhorst, 2006).

Data information: In both (A) and (B), solid points represent averaged quantities across all samples, while blue lines show a linear fit to the data.

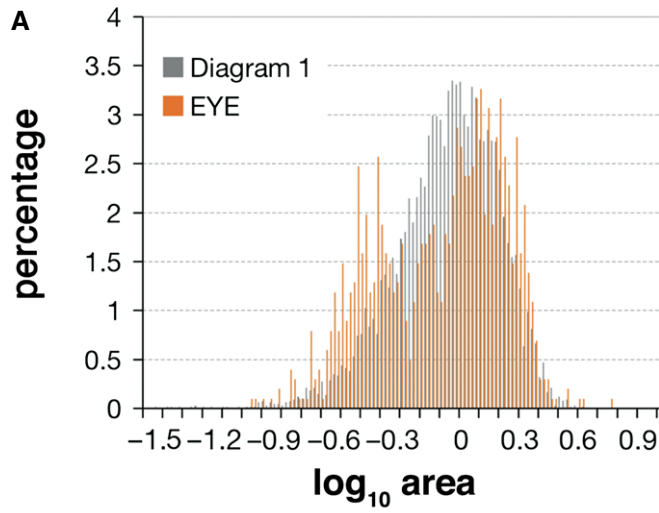
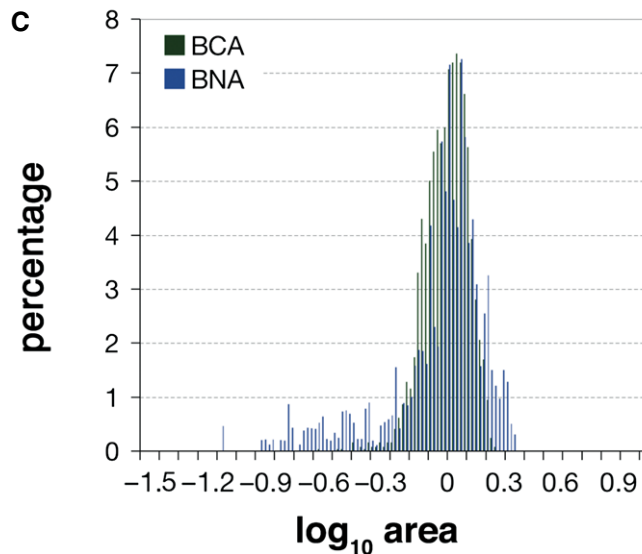
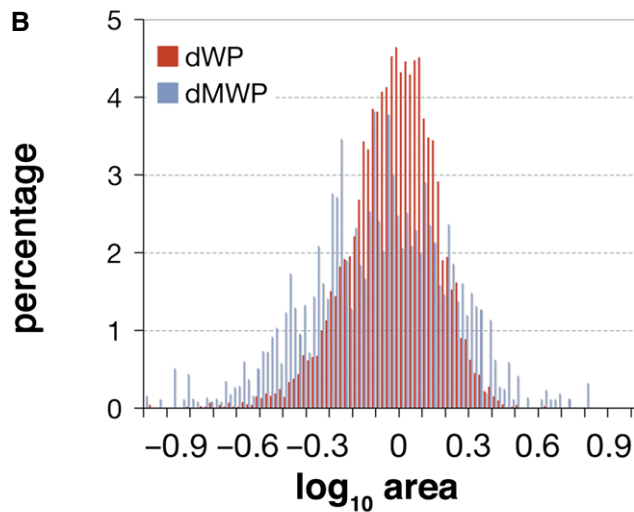


Figure EV3. Comparison of area distribution of diverse natural tissues.
 A Comparison of the area distribution of Diagram 1 and EYE. The eye presents a left-skewed bimodal distribution of areas.
 B Comparison of the area distribution of dWP and dMWP. The mutant wing presents a more irregular frequency of sizes and slight left skewness.
 C Comparison of the area distribution of BCA and BNA. The high number of small atrophic fibres characteristic of neurogenic atrophies produces a left-skewed distribution shape in the case of BNA.



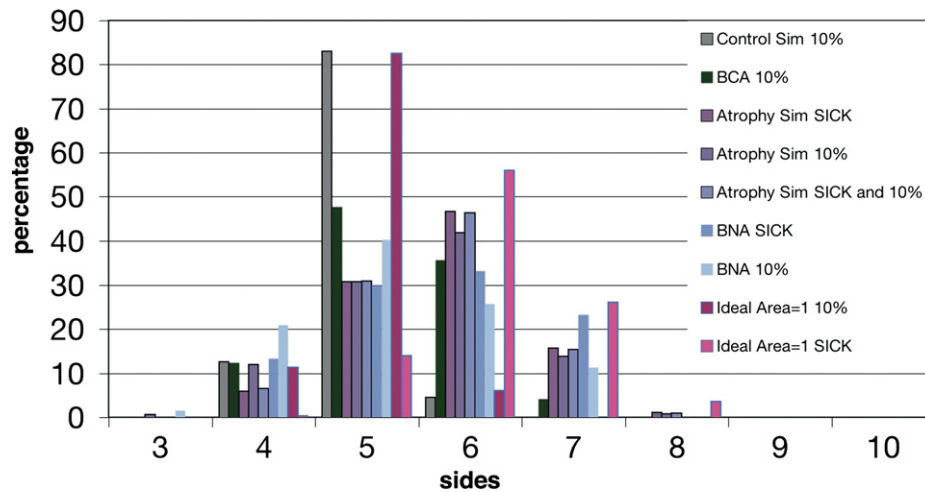


Figure EV4. Polygon distribution of different subset of cells from muscle samples and simulations.

Comparison of the polygon distribution of different subsets of cells: the atrophic cells of the BNA images (see Materials and Methods), the 10% of the smallest cells from BCA and the three simulations, and the selected “sick” cells with different parameter values from the atrophy simulation and ideal area = 1 simulation (see Materials and Methods). “control simulation 10%”, “ideal area = 1 simulation 10%”, “BCA 10%”, “BNA 10%” and “atrophy simulation 10%” presented a higher percentage of pentagons than hexagons. On the other hand, when analysing the “atrophic cells” from “BNA sick” and “atrophy simulation sick,” an increase of hexagons and heptagons was observed. “Atrophy simulation sick”, “atrophy simulation 10%” and “atrophy simulation sick and 10%” presented a similar polygon distribution since in this simulation most of the sick cells are included in the 10% smaller cells (Table EV2). The small difference between “BNA 10%” and “BNA sick” reflected the presence of small rounded cells inside the smaller 10% of BNA cells. The polygon distribution of the “ideal area = 1 sick” cells was due to the higher area presented by this subset of cells that gives them higher number of neighbours (Fig 6C and Table EV2).

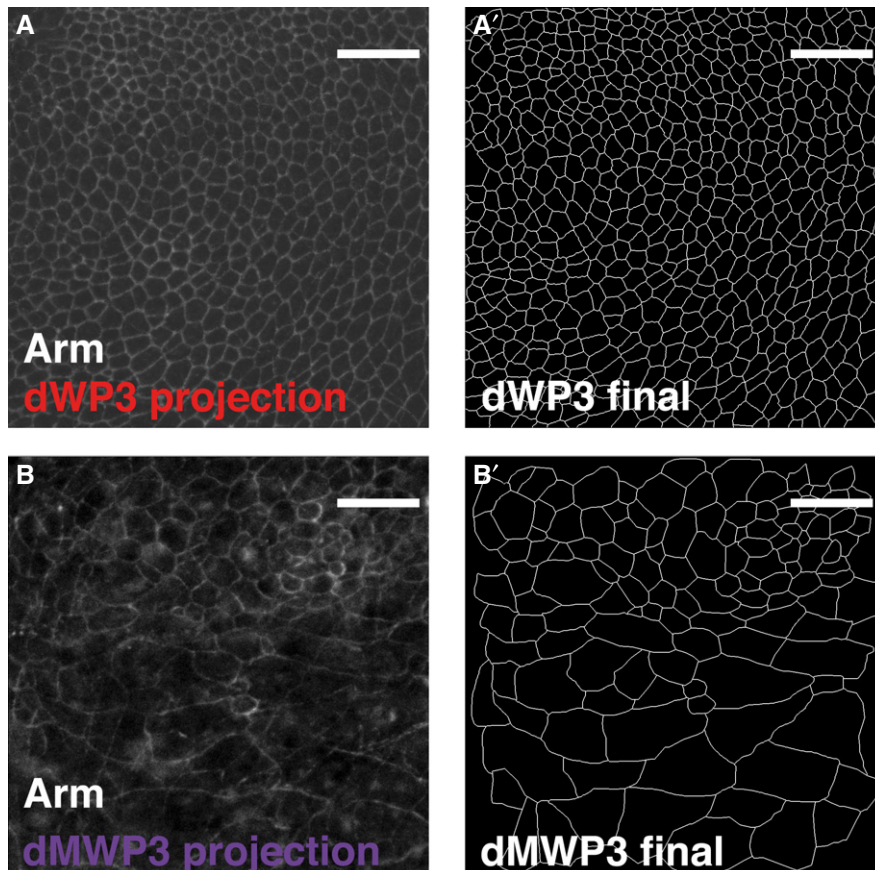


Figure EV5. Original images processed to obtain segmented data.

A Projection of the original confocal stack used to segment dWP3 sample.
 A' dWP3 final segmented image.
 B Projection of the original confocal stack used to segment dMWP3 sample. Some confocal sections included signal from the peripodial membrane of the wing imaginal disc. Therefore, part of the processing was manual.
 B' dMWP3 segmented final image. The signal from the peripodial membrane has been removed.

Data information: Scale bars: 10 μ m.