



Variations within hides and skins

PART 1: THE INFLUENCE OF THE FIBRE STRUCTURE

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The natural structure of hides and skins has a fundamental influence on the physical properties and characteristics of each piece of leather.

Grain and corium

The general structure of hides/skins is provided by the classic "Sharphouse" cross-section diagram (*Panel 1/1*), with the intricacies of the grain and corium layer revealed as Panels 1/2a and 1/2b respectively. The grain layer comprises a fine dense fibre structure with a low angle of weave to the horizontal, offering a dense/tight structure for the final leather. As the grain layer contains many structures - hair follicles, sebaceous glands, blood capillaries - there is little room for large collagen fibre bundles that provide strength, so the grain layer is relatively weak. In contrast, the fibre bundles in the corium are larger and at a higher angle of weave, and this provides strength to the structure. The greater the proportion of grain to corium at a given substance, then the weaker the leather.

Cross-hide/skin variations

There are considerable structural variations found across a hide/skin. This is made clear by study of cross-sections taken from the butt and belly parts as shown in Panels 1/3a and 1/3b. This shows a more dense fibre structure in the butt area with a relatively high angle of weave, whereas in comparison the belly area is more open structured and has a lower angle of weave. Also the butt areas are denser, and the belly parts contain more voids. At a given thickness, the belly areas stretch more easily, are softer and weaker than the butt areas, and tend to show a looser break in the final leather thus restricting the usage of leather from these parts.

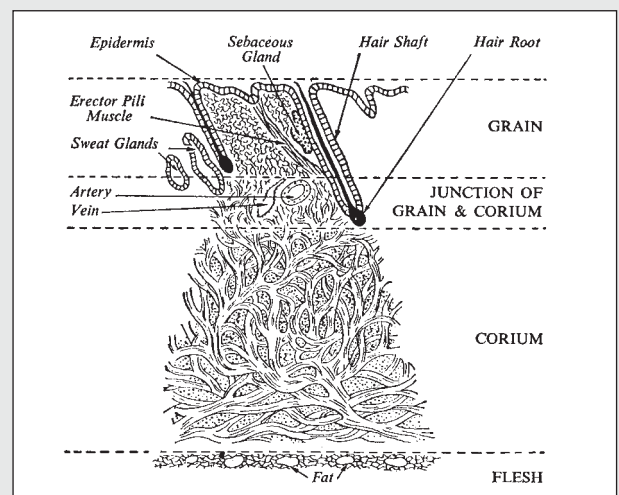
The directional run

In addition to these structural differences seen within vertical cross-sections, and the effects that arise from these variations, there is an underlying cross-skin fibre configuration that also needs taking into close account.

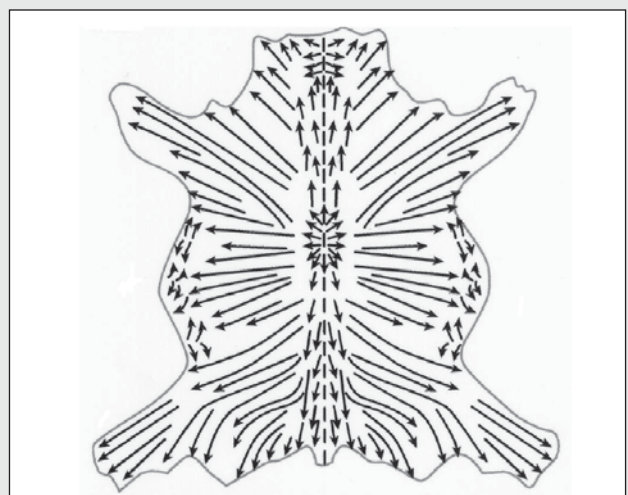
This structure runs parallel to the grain surface, and is formed according to the degree and direction of flexibility required by the living animal. This is known as directional run or fibre-run. This can be identified in sections of corium taken horizontal to the grain surface, and is shown as Panels 1/4a and 1/4b. In particular, the horizontal directional run of the fibres is revealed within sample 1/4b taken from the belly region.

Under a given load the leather will stretch less in a direction parallel to this underlying fibre direction, the tensile strength will be greater, and the leather will bend more easily. The directional variations are less marked in the butt areas, so the variations in physical properties (*tensile strength/extension*) are less when compared to the belly parts.

Panel 1/1a: Cross-section of skin



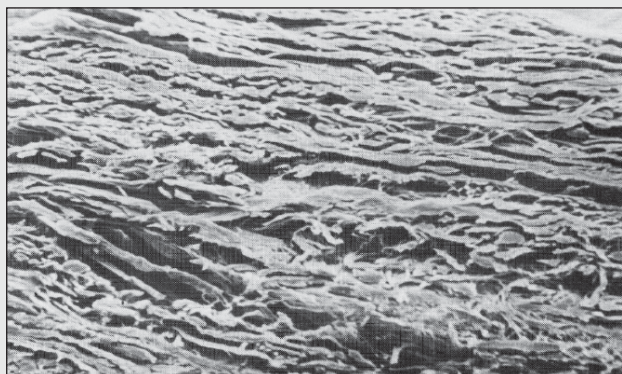
Panel 1/1b: The direction of fibre-run



The differences in physical properties associated with the direction of fibre-run are considerable. They are modified within leather processing, but remain significant within the cutting of leather components, and for shape retention within consumer products.

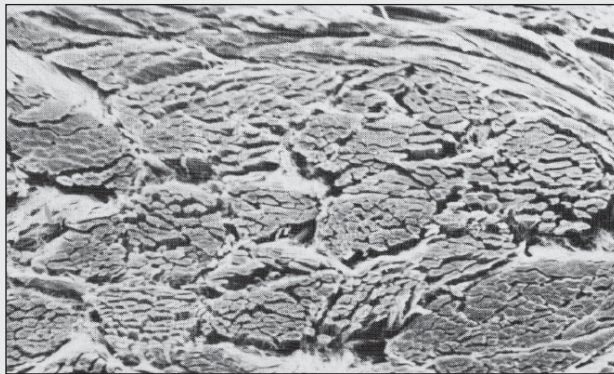


Panel 1/2a: Fibre structure: grain layer



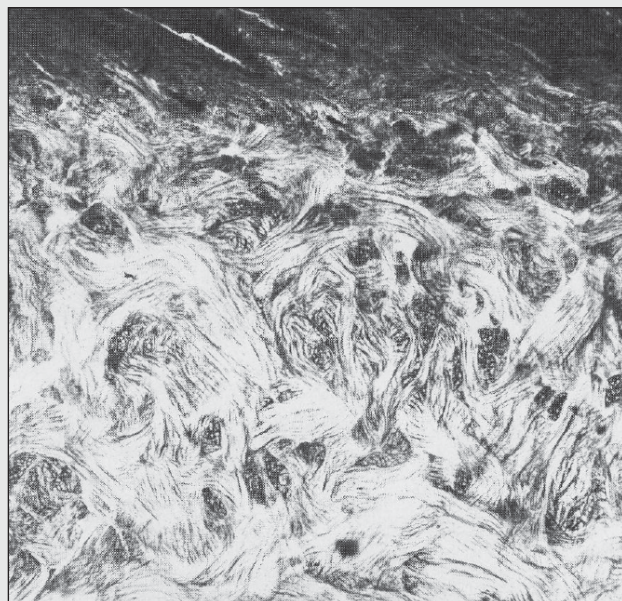
Panels 1/2a and 1/2b: both show cross-sections from calfskins at X500 magnification.

Panel 1/2b: Fibre structure: middle layer

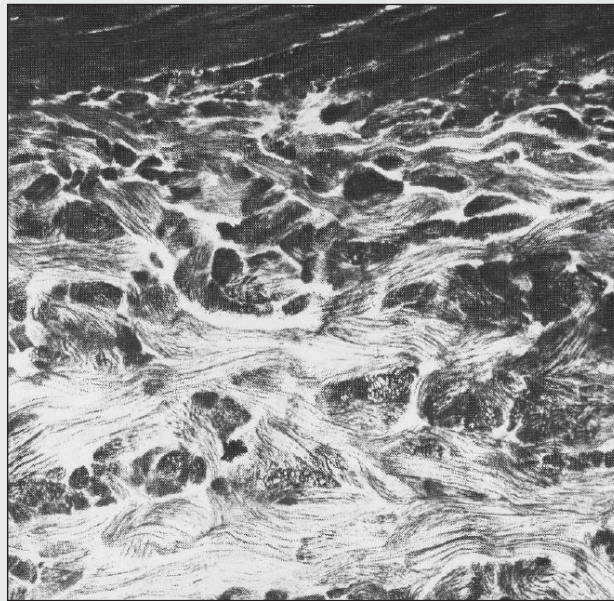


Circular sections: fibres severed as result of sampling.

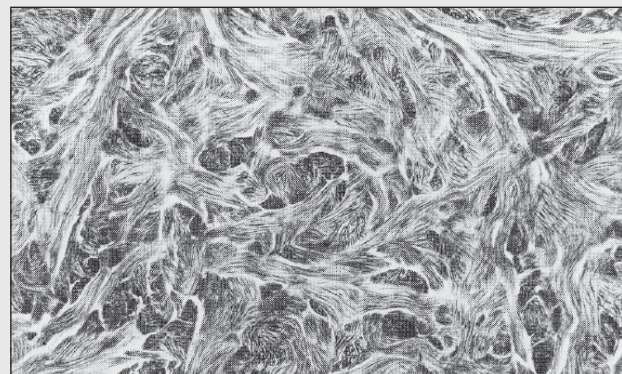
Panel 1/3a: Hide butt: cross-section



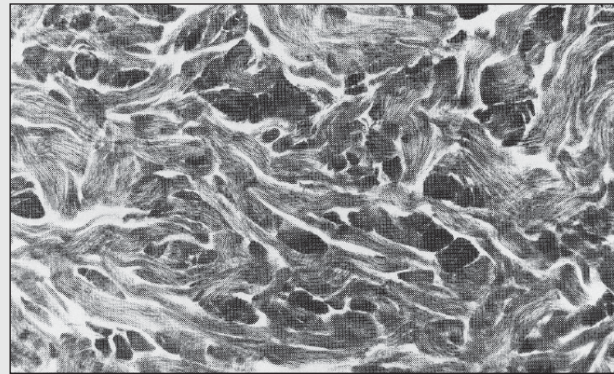
Panel 1/3b: Hide belly: cross-section



Panel 1/4a: Hide butt: parallel grain section



Panel 1/4b: Hide belly: parallel grain section



Acknowledgements

- Panel 1/1a credit: J.H.Sharphouse.
- Panel 1/2b unknown.
- Other images credit: Betty Haines: selected from the document "The fibre structure of leather", courtesy of the Leather Conservation Centre, Northampton, United Kingdom.