

Brain Tanned Leather for Bookbinding: History, Use, and Identification

Katherine S. Kelly (Library of Congress), Dan Paterson (Library of Congress),
Frank Trujillo (Morgan Library & Museum), Lydia Aikenhead (CCAHA)

INTRODUCTION

While researching an 1805 American frontier journal, one member of this research team noted the particular qualities of the leather used to form the journal's wrapper. Unlike vegetable tanned skin, it was pliable and soft and had a suede surface. Considering the journal's provenance and context of historical production, brain tanned leather seemed likely.

The use of brain tanned leather has been well documented in various contexts of material production, but its prevalence within the history of bookbinding was uncertain and understudied. Through examination of examples of confirmed or suspected brain tanned or fat tanned animal skins used in bookbinding, this study sought to establish the historical and geographic circumstances of use, to define physical characteristics, and to establish a set of visual identification techniques.

METHODOLOGY

This study focused on visual examination techniques as a means of identifying brain tanned skin. Because advanced analytical equipment is often unavailable in libraries and archives, this study sought to establish parameters of identification that are practical to carry out with the equipment that many library conservation departments already have on hand.

HISTORY AND USE

As when some master tanner gives his crews the hide of a huge bull for stretching, the beast's skin soaked in grease and the men grab hold, bracing round in a broad circle, tugging, stretching hard till the skin's oils go dripping out as the grease sinks in

- The Iliad, Book XVII

- Brain tanning, among the oldest methods of preserving skin, has been documented in Southern Europe, Scandinavia, Japan, Mongolia, Southern Africa, and North America. The soft, stretchy material is suitable for clothing, shelter, and bags. Brain tanning is labor intensive, but skins can be processed in several days using minimal tools and materials.
- In Europe, brain tanning seems to have been supplanted by vegetable tanning and alum tawing, methods that both take longer to carry out and which are more complex. Typical European bookbinding elements like chemises, thong supports, and overcovers were made from soft skins that were not vegetable tanned, but may have been produced via alum tawing or oil tannage.
- Brain tanning was widespread among Native American nations until the mid-19th century. Prepared skins were a common item of trade between European colonists and Native Americans. Deerskins, both processed and raw, were a major export item, usually for use in buckskin clothing.

HOW IT WAS MADE

Fleshing: Fat, meat, and membrane are removed from the flesh side of the skin.

Alkalizing (or bucking): The scraped skin is alkalized by soaking in a wood ash and water solution.

Graining: The epidermis and grain of the skin are removed by scraping.

Rinsing: Rinsing in water, sometimes with the addition of weak acids, removes the alkaline agents introduced earlier and further softens the skin.

Dressing: A dressing of brain matter mixed with water is applied to the skin until saturated.

Softening: Softening is achieved through physical manipulation of the skin.

Smoking: Smoking introduces aldehydes, allowing the skin to be wetted out and dried repeatedly and imparting the tan, yellow, or brown color associated with "buckskin" leathers.

FINDING IT IN OUR COLLECTIONS

Brain tanned skin is likely to be unidentified or misidentified in descriptions of bookbindings. When seeking potential examples in library catalogs, contextual clues and searching related terms from the following categories may be helpful:

- Soft, flexible skins: tawed skin, alum tawed skin, chemise, reversed leather, reversed skin, suede, limp.
- Related preservation processes: oil tanned skin, chamois, fat tanned skin, smoke tanned skin, buckskin, organ tanned skin.
- Species-related terms: deerskin, buckskin, doeskin, elk skin, bison, buffalo.

PHYSICAL AND VISUAL CHARACTERISTICS

Species: Frequently bison, deer, or elk. Domesticated animals such as calf, sheep, or goat are less likely.

Physical characteristics: The grain layer is often removed to allow the oils to fully penetrate the skin. The skin is stretchy and easily deformed. Cut edges do not maintain 90 degree angles, and slits can be pulled into soft, round holes.

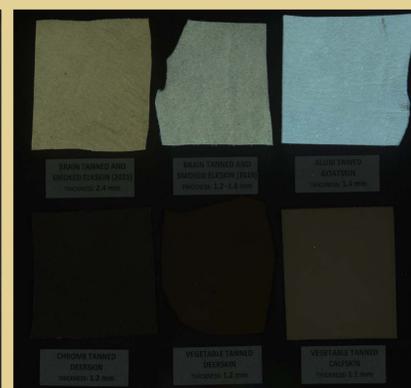
Color: Brain tanning initially produces skins that are off-white. Subsequent smoking can impart a variety of yellow, cream, gray, or light brown colors.

UV examination: Rawhide, parchment, alum tawed, urine tanned, and brain tanned skins all fluoresce, while vegetable and chrome tanning strongly quenches fluorescence. Brain tanned skins that have been dyed or painted with tannin-based colors will also appear black on the surface, though some fluorescence may be visible in cross section or abraded areas.

Transmitted light: In strong transmitted light, rawhide, parchment, alum tawed, urine tanned, and brain tanned skins show skin translucency. Vegetable tanned and chrome tanned skins do not.



Samples of brain tanned, alum tawed, chrome tanned, and vegetable tanned skins under normal illumination. Note the suede surface texture and lack of grain layer in the brain tanned samples.



Under UV illumination, brain tanned and alum tawed skins fluoresce, while chrome and vegetable tanned skins do not.



Brain tanned and alum tawed skins allow transmitted light to pass, while chrome and vegetable tanned skins do not.

Identification of Brain Tanned Skin in Bookbindings



LIKELY BRAIN TANNED

William Clark, Elkskin Journal, 1805. Courtesy of the Missouri Historical Society, St. Louis.

Normal illumination (left) and detail under UV (right). Soft skin wrapper fluoresces and allows transmitted light to pass. In combination with color, tactile qualities, and a well-documented context of production, this evidence strongly indicates that the journal was bound in brain tanned skin.



LIKELY BRAIN TANNED

Joseph Whitehouse, Journal Commencing at River Dubois, 1804-1805. Courtesy of the Newberry Library.

Normal illumination (left) and detail of skin edge (above). This journal is closely related to the Elkskin Journal. The soft skin wrapper fluoresces, allows transmitted light to pass, and is likely made from brain tanned skin.



LIKELY BRAIN TANNED

Herbert Myrick, *Cache la poudre: the Romance of a Tenderfoot in the Days of Custer*, New York, 1905. Courtesy of the William L. Clements Library, University of Michigan.

Limited edition advertised as being "Bound in Indian Smoke Tanned Buckskin." Surface texture, flexibility of cut fringe, and fluorescence under UV (right) supports identification of brain tanned skin.



LIKELY BRAIN TANNED

James Evans, [Hymns, Swampy Indians, their speech], 1841. Courtesy of the Newberry Library.

Skin wrapper fluoresces and allows transmitted light to pass. Book was printed, bound, and distributed in a remote Canadian mission and was likely made with a brain tanned skin wrapper.



NOT BRAIN TANNED

De Officiis, England, 1150-1199. Courtesy of the Morgan Library & Museum.

Soft overcover fluoresces under UV light. Fluorescence is partially masked by surface dirt and coloration, and more apparent at abraded areas and folds. More recent vegetable tanned leather spine repair does not fluoresce at all. Based on context of production and intact grain layer, overcover skin is probably alum tawed.

CONCLUSION

This study established that brain tanned skins were used for bookbinding within the context of North American book production with connections to Native American communities. Books described in catalogs as being bound in deerskin or even buckskin in medieval European context were not proven to be brain tanned using the cited methodology. The classification of deerskin, doeskin, or buckskin in medieval bindings should be understood as descriptors of the physical qualities of a skin, rather than an indicator of skin species or method of skin preparation.

The authors hope that, by raising awareness of the use of this material in bookbindings, custodians of book collections will gain a better understanding of the context in which brain tanned leather bookbindings were created, and that the methodology discussed will assist in creating ever more accurate bookbinding descriptions in collection catalogs.

FUTURE RESEARCH

Further research would seek to confirm the identity of suspected examples of brain tanned skin through spot testing (when microsampling is possible). Microchemical spot testing could serve as a practical means of differentiating brain tanning from visually similar tannage techniques such as alum, smoke, or oil tanning.

At present, several research groups are investigating the use of techniques like mass spectrometry, spectroscopic imaging, and peptide mass fingerprinting to identify brain tannage and confirm the animal species of skins.

Poster presented at AIC Annual Meeting, Los Angeles, May 13-17, 2022

REFERENCES

- Chiu, Yueh-Ting, Aleksandra Popowich, Romare Antrobus, Theanne Schiros, Helen H. Lu, and Julie Arslanoglu. 2021. "How It's Made: Emulsion (Organ) Tanned Leathers." Poster presented at Art Bio Matters Conference.
- Emmerich Kamper, Theresa. 2020. *Determining Prehistoric Skin Processing Technologies: the macro and microscopic characteristics of experimental samples*. Leiden: Sidestone Press. <https://www.sidestone.com/books/determining-prehistoric-skin-processing-technologies>.
- Reed, R. 1972. *Ancient Skins, Parchments and Leathers*. London: Seminar Press Ltd. 65-72, 252-256.
- Richards, Matt. 2004. *Deerskins into Buckskins: How to Tan with Brains, Soap or Eggs*. 2nd Edition. Cave Junction, Or.: Backcountry Publishing.