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Structural Analysis Of Hair Samples For Identification Of Ancient Textiles.

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Trying to identify the composition of a First Nation's blanket from the mid 1800s, led to investigating samples from early blankets in Museums around the World using scanning electron microscopy and light microscopy.

Fig.1 Former Chief Lenard George of the Burrard Band Coast Salish wearing the subject wooldog blanket

The Coast Salish people from the Northwest Coast of British Columbia, Washington State and Northern Oregon are known for their expertise in weaving blankets from a mixture of mountain goat hair, plant fibres, and the hair of a now extinct dog called a wooldog. In the subject blanket, the mountain goat hair was easily identifiable and the other hair from the wooldog did not match up to anything in our extensive databank of hair pictures. The nearest we could find was Samoyed dog. What we needed was a sample of authenticated wooldog

Through serendipitous researches of an amateur historian Candace Wellman in Whatcom County, Washington State, the Smithsonian Museum recently (2004) discovered a pelt of a wooldog named "Mutton" held in a drawer lost for over 150 years. The publication of the hair structure allowed us to positively identify wooldog in several of our specimens.

Wooldog pelt "Mutton"

Fig. 2 *Mutton* was the pet of George Gibbs, ethnologist and geologist for the NW Boundary Survey U.S. team. Circa 1854

Photos by Rick Shulting

After reviewing many samples from blankets with early collection dates from museums around the world, we concluded that all the blankets contained a mixture of hairs. Some included plant fiber and/or down feathers, most contained mountain goat hair. Some confusion flows from the observation that one species may have different patterns of scales within one hair. Moreover taking hairs from different parts of the body of the same animal generally produces a wide variety of scalar patterns lessening the diagnostic value. Thus using only one criteria of "scale pattern" is insufficient to confidently identify a species.

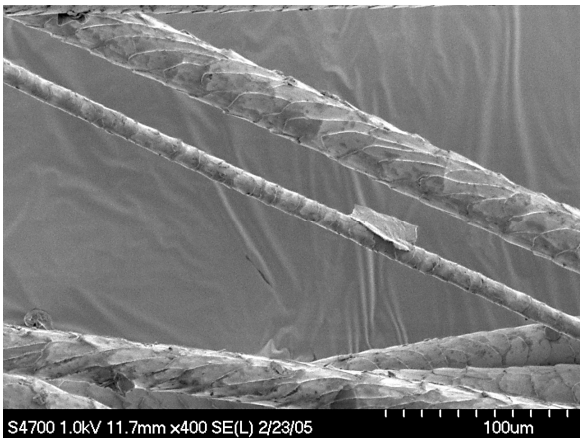

Fig. 3a mountain goat showing a variety of scalar patterns

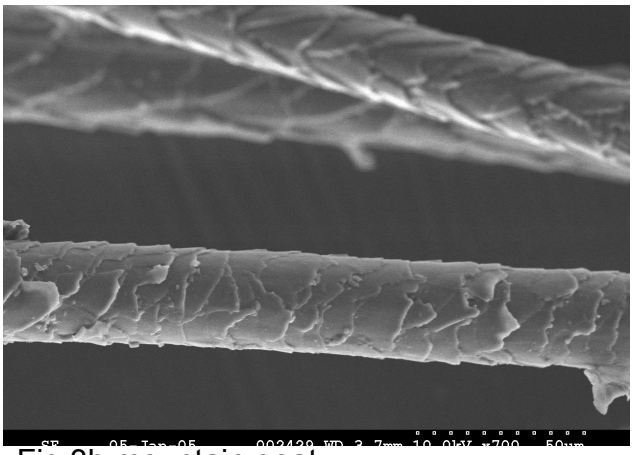

Fig 3b mountain goat

We began a study of hairs to reveal alternate diagnostic characteristics, which could be used for identifying different species. We found that making cross-sections of the hair particularly longitudinal sections to show the medulla structure and cortex thicknesses, became the most important diagnostic approach. The species differences were much clearer. However the difficulty is in cutting consistently clean and accurate longitudinal cross sections of the hair, which was often thinner than the blade used. LM then became the tool.

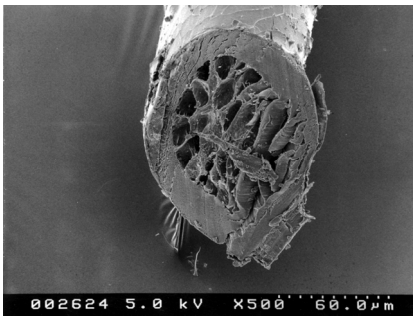

Fig. 4a mountain goat hair transverse cross section

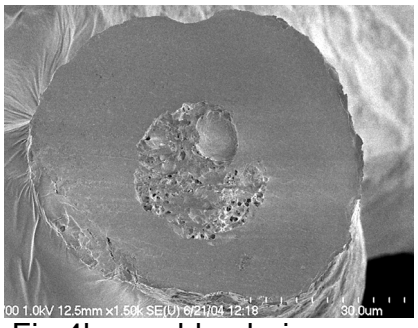

Fig 4b. wooldog hair transverse cross section

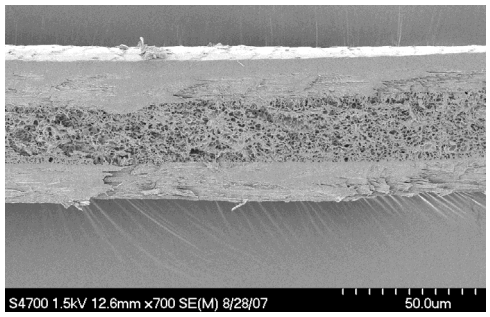

Fig. 4c wooldog hair longitudinal cross section

Scanning electron microscopy provides great surface detail, but is limited because of the similarities of the scalar patterns in different species and the differences of scalar patterns within the same hair. We needed light microscopy to give internal features of the thinner hair. The thicker guard hairs were too dense for the light microscope but were relatively easier to section longitudinally for the SEM.

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