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To:

Wibke Ottweiler
Dipl.-Rest.
Germanisches Nationalmuseum
Institut für Kunsttechnik und Konservierung
Kartäusergasse 1, 90402 Nürnberg

Subject:

Peptide mass fingerprint analysis of tendon samples from two painted wood panels: Lucas Cranach the Elder and Workshop, Martin Luther, #1543/46 and Lucas Cranach the Elder and Workshop, Kurfürst Johann der Beständige von Sachsen, #1532/33.

Background:

Both paintings have fiber masses covering panel joints, likely glued to the panel with animal glue. Peptide mass fingerprint (PMF)[1,2,3,4] analysis was requested to identify the mammalian source of the fibers. Samples were supplied by Wibke Ottweiler.

Summary of results:

Cattle was identified as the source of the fibers.

Analysis:

PMF analysis involves the enzymatic digestion of proteins followed by Matrix Assisted Laser Desorption-Ionization Time of Flight mass spectrometric (MALDI) analysis of the resultant peptide mixture. Each protein has a unique sequence of amino acids, thus, the mixture of peptides is unique–a "peptide mass fingerprint." Marker ions[5,6] in the MALDI spectra from known reference materials are compared with those from unknown samples for identification

Figure 1 shows painting 1543/46 and verso where samples were obtained.
Figure 2 is the PMF (MALDI) spectrum from 1543/46 with cattle markers indicated.
Figure 3 shows painting 1532/33 and figure 4 shows the PMF (MALDI) spectrum with cattle markers indicated.

Figure 1. Lucas Cranach the Elder and Workshop, Martin Luther, #1543/46 and verso where samples were obtained.

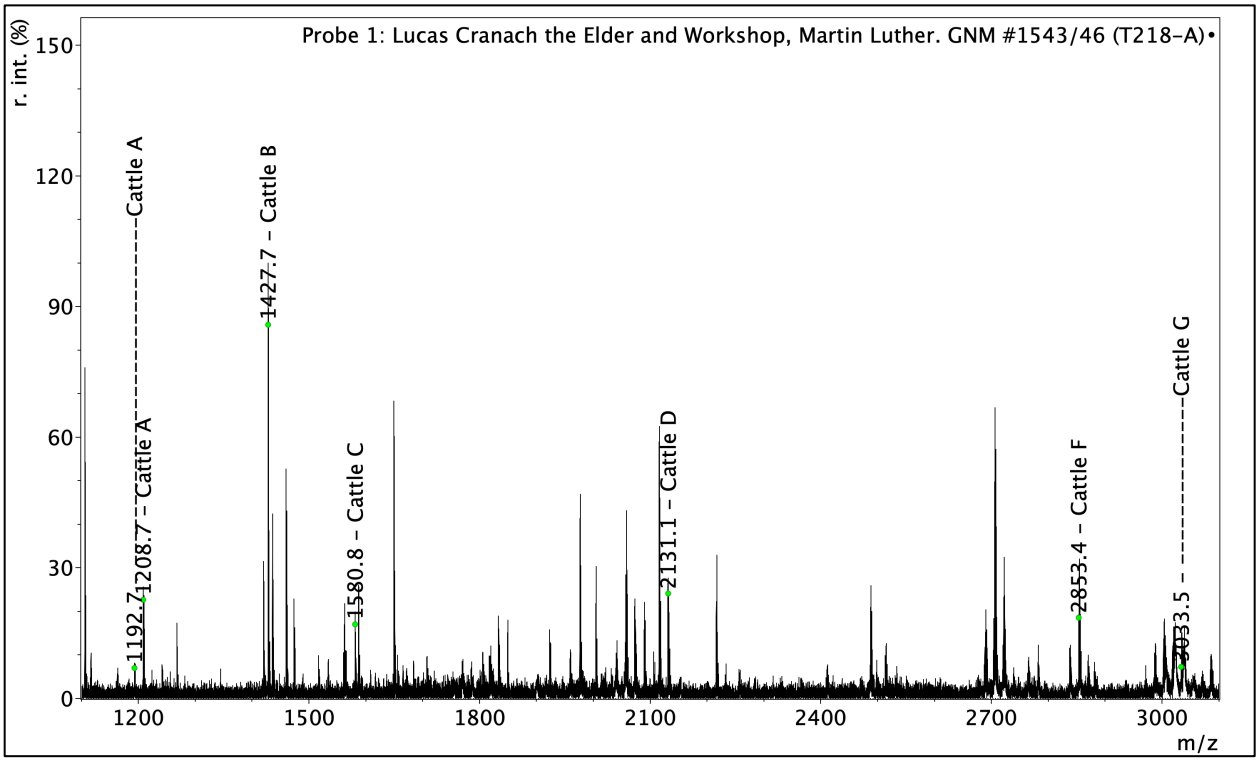

Figure 2. PMF (MALDI) spectrum from 1543/46 with cattle markers indicated.

Figure 3. Lucas Cranach the Elder and Workshop, Kurfürst Johann der Beständige von Sachsen, #1532/33.

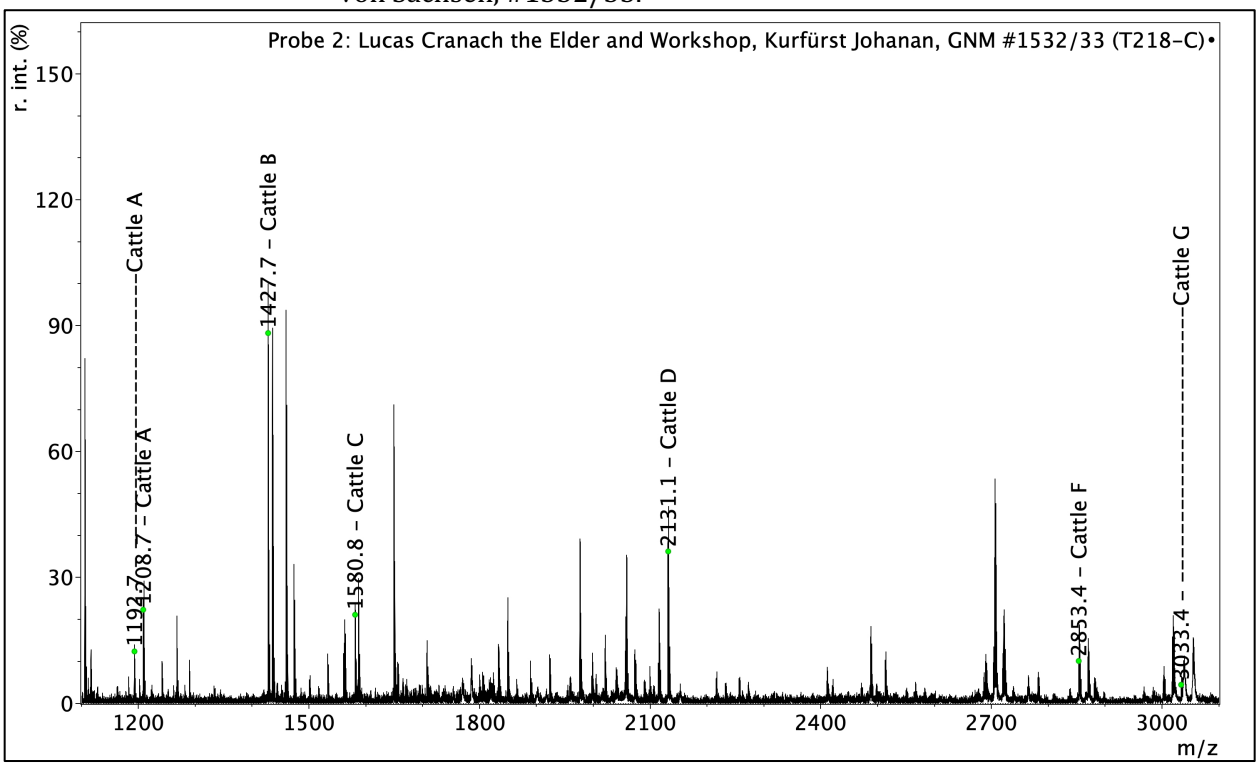

Figure 4. PMF (MALDI) spectrum from 1532/33 with cattle markers indicated.

[1] Kirby, D. P., N. Khandekar, J. Arslanoglu and K. Sutherland, "Protein Identification in Artworks by Peptide Mass Fingerprinting," Preprints, ICOM-CC 16th Triennial Conference, Lisbon, Portugal, (September, 2011).

[2] Kirby, D., M. Buckley, E. Promise, S. Trauger and T. R. Holdcraft 2013, "Identification of collagen-based materials in cultural heritage," Analyst (138) 4849-4858.

[3] Promise, E., T. Rose Holdcraft, D. Kirby, and S. Haakanson, "Identifying collagen-based materials: A cross-cultural collaboration," Preprints, ICOM-CC 17th Triennial Conference, Melbourne, Australia (September, 2014).

[4] Henzel, W. J., C. Watanabe and J. T. Stults 2003. "Protein identification: the origins of peptide mass fingerprinting," J. Am. Soc. Mass Spectrom. (14) 931-942.

[5] M. Buckley and M. J. Collins, *Antiqua*, 2011, (1) 1-7.

[6] D.P. Kirby, N. Khandekar, J. Arslanoglu, K. Sutherland, Protein identification in artworks by peptide mass fingerprinting, in: Prepr. ICOM Comm. Conserv. 16th Trienn. Conf. Lisbon, 2011.