Final Report

My PhD focuses on advancing methods for human identification in large-scale missing persons cases, such as post-war recoveries, mass disasters, and migration scenarios. While traditional STR typing remains a cornerstone in forensic genetics, it is often limited when direct reference samples are unavailable or when remains are highly degraded. Forensic Genetic Genealogy (FGG) has emerged as a promising alternative, but its cost and labor intensive, has significant resource requirements and complex ethical considerations around consent and third-party data use. To address these gaps, my work explores alternative markers, specifically SNPs and Microhaplotypes (MHs), with the ultimate goal of developing a cost-effective MH panel for distant kinship analysis (beyond second-degree relatives) in challenging forensic contexts. At Sam Houston State University (SHSU), I began this research by evaluating the MH118 panel (Puente et al., 2019) on burned bone samples provided by Dr. Amy Mundorff (University of Tennessee).

My exchange visit to King's College London (KCL), under the supervision of Dr. David Ballard, focused on developing bioinformatics expertise, particularly through the use of tools such as STRait Razor and FDSTools for data processing and comparative analysis, as these tools had not previously been explored to analyze the current MH panel. During the visit, we also prepared a sequencing library for the samples using the Kintelligence HT panel to enable a comparative evaluation alongside the MH panel. This visit marked the beginning of a collaborative initiative between SHSU and KCL to design a new kinship-focused MH panel by integrating the revised MH118 loci with a set of markers curated by the King's team, with the goal of enhancing the panel's overall identification power.

This collaboration not only deepened my analytical skills but also laid the groundwork for a robust, cost-effective panel that could significantly simplify human identification in complex cases with distant relatives as reference samples.

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