

LUX: A TOOL SYSTEM FOR IMPROVED MICROSCOPIC SAMPLE COLLECTION

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Collecting trace amounts of DNA from sample surfaces of interest is complicated by a number of challenges. Beyond the variability of the surface material composition, the trace DNA is distributed unevenly across the surface plane in sub-nanogram quantities. The tape lift method of collecting trace samples is an effective technique for collecting and concentrating these samples. In one variation of this method, water-soluble tape is wrapped onto closed forceps for targeted sample collection; however, deficiencies in this method for assisting in the collection of trace DNA with efficient extraction yields required the development of a new set of collection tools. Leveraging the tape lift method, the Lux collection tools were developed to address the challenges of the laboratory technician in acquiring trace amounts of DNA disparately deposited across the surfaces of objects of interest. The collection tools aim to use the least amount of tape to collect and concentrate the most amount of trace DNA. Additional attention was required to devise functionality for attaching and detaching sample collection tape in a process that could be performed by a single technician while preventing sample contamination. Using additive manufacturing technologies for rapid prototype development, the iterative design process resulted in two sample-specific trace DNA collection implements and a single-user work stand. Evaluations of the Lux tools show an order of magnitude increase in recoverable trace DNA from the baseline tape-lift method.