**University of Leicester**

**Future 50 PhD Scholarship**

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| **Project Reference** | GGE Carr |

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| **First Supervisor** | Dr Andrew Carr |
| **School/Department** | Geography, Geology and the Environment |
| **Email**  | asc18@le.ac.uk | **Telephone Ext** | 3851 |

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| **Second Supervisor** | Dr Mark Powell |
| **School/Department** | Geography, Geology and the Environment |
| **Email**  | dmp6@le.ac.uk | **Telephone Ext** | 3850 |

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| **Additional Supervisor** | Joerg Kaduk |

**Section 2 – *Project Information***

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| **Project Title** | How fast is the fluvial conveyor? Developing luminescence-based approaches to characterise catchment sediment fluxes to oceans |
| **Project Highlights:** | 1. | Apply new geochronological methods to address key questions surrounding landscape evolution and the management of human impacts on rivers and their catchments |
| 2. | A multi-faceted project bringing together approaches and methods from palaeoenvironments, geochronology, process geomorphology numerical modelling and environmental management |
| 3. | Join a growing research area in GGE linking our understandings of geomorphic process to human impact and the Anthropocene. |
| **Project Summary**  |
| River catchments represent the fundamental landscape units within which sediment is transferred from sources (uplands) to sinks (the ocean). In the Anthropocene, these sediments now include a variety of pollutants (Thomas et al., 2022) and plastics (Newbould et al., 2021). How long it takes these, along with the sediment, to move through a catchment is thus directly relevant to the fates of pollutants, the legacies of anthropogenic land disturbance, and the functioning of broader river management strategies. Long-term (decades and longer) rates of sediment transfer are not controlled by the rate of transfer during floods, but by *sediment storage time,* as most sediments spend much of their journey stored within (e.g.) floodplains. Rivers are thus “jerky conveyors”, whereby characterisation of sediment storage time is the key metric to understand overall transfer rates (Pizzuto et al., 2022). Earth scientists continue to have a poor understanding of these storage times as data that align to the relevant 101 - 103-year timescales are challenging to obtain (Huffman et al., 2022; Phillips et al., 2006). While numerical modelling predicts significant variability in floodplain turnover (Feeney et al., 2020), empirical data for storage time distributions (and the probability of (re)mobilisation) remain sparse. Geochronological (Luminescence dating) methods – more often applied to questions of palaeoenvironment – have much to offer on this subject (Grey et al., 2017; Pizzuto et al., 2022). As the luminescence “clock” starts and stops with geomorphic (sediment transport) processes these methods are, in fact, particularly germane to this problem.This PhD will develop a luminescence-based framework to evaluate floodplain storage and catchment sediment transfer rates in exemplar UK catchments. Developments in luminescence methods that have increased lab throughput and allow field-based measurements mean that high-intensity chronometric sampling of floodplain deposits is now possible (Pears et al., 2020). From such data, the age distributions and residence times of floodplain deposits can be derived (Huffman et al., 2022; Pizzuto et al. 2022). Current works suggest significant intra and inter-catchment variability in such parameters, suggesting a need for UK and catchment-specific estimates in order to realise the great catchment management potential of such data.  |