

FLAG ARISES FROM THE COVID ASHES: FLAG 2025, TÜBINGENEllery Littlewood¹, David Bridgland¹, and Tobias Lauer²¹Durham University, Durham, UK²University of Tübingen, Tübingen, Germany

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The first face-to-face meeting of the Fluvial Archives Group (FLAG) since the hiatus caused by the Covid pandemic took place in Tübingen, Germany, 4–7 September 2025. Led primarily by Tobias Lauer, with a strong team of supporters, this followed the template that had become traditional for FLAG since it began its programme of Biennial meetings (which followed the end, in 2000, of its period as a QRA-funded working group). Thus, two days of oral presentations and posters were followed by two days of field excursions, all based in Tübingen.

The discussion meeting was in the Geo- and Environmental Center (GUZ) at Tübingen University, with refreshments in the foyer and visits to a nearby refectory for lunch. Day 1 began with the customary introduction and welcome to members, old and new, and was followed by four themed sessions throughout the day. These comprised ‘fluvial geomorphology, tectonics and sedimentation/erosion’ and ‘Fluvial climate/palaeoenvironmental archives’ in the morning, with ‘Rivers and human impact/geoarchaeology’ and ‘Holocene and late Pleistocene fluvial processes’ in the



Figure 1. FLAG participants outside the GUZ (top) and on the excursion (bottom).

afternoon. At the end of Day 1 there was an organized meal in a restaurant specializing in traditional local cuisine.

Day 2 dawned with rain coming in over the nearby Swabian Alb, making for an atmospheric backdrop to the conference proceedings. The ‘Holocene and late Pleistocene fluvial processes’ session continued from Day 1, with an extended coffee break to allow for a poster session taking up the rest of the morning. In the afternoon, there was time for a general session and then one focussed on dating and geochronology, which was followed by a field briefing and a discussion about the location of the 2027 FLAG conference. Our colleagues based in Britain will, no doubt, be delighted to hear that the next FLAG will be in Essex in September 2027, to be organized by DRB and EL – more details to follow!

We were also treated to a tour of the fantastic labs and told about the dating capacities in-house at the GUZ on the afternoon of Day 2. Thankfully the rain had eased off by the evening which allowed us to have a dry and relaxing voyage on the River Neckar in a pair of (professionally operated) punts. The good weather held up for the excursion too, which everyone was glad of. Across the four days, FLAG was delighted to hear the work of colleagues from a breadth of career

stages, from Masters students to well-established professors, with people travelling from ten countries to be at the conference (Figure 1).

The first excursion day saw the party join a coach in the GUZ car park for a drive to a viewpoint at Heuchelberg, high on a slope covered in heavily laden vines. This provided a view over the Neckar valley to the higher Löwensteiner Berge uplands in the distance. Here was discussed the geological setting of the Neckar valley, the understanding of its terrace sequence and means of dating this: transitioning in recent times from biostratigraphy and interpretation of loess overburden with soils to an emphasis on numerical geochronology. This is of considerable significance given that the hominin fossil localities of Steinheim (see below) and Mauer (type locality of *Homo heidelbergensis*) fall within this sequence (Bibus and Wesler, 1995).

The main site of the morning was a nature conservation site at Frankenbach in the Heilbron Basin (see Littlewood et al., 2025). This was worked as a gravel pit from the early 19th until the late 20th Century, which involved removal of several metres of loessic overburden. After working ceased it has been managed to maintain the disturbed-ground, minor wetland and small-pond communities that had



Figure 2. Frankenbach disused quarry showing (a) the loess deposits capping the exposed sequence, (b) imbricated fluvial gravels of the 33 m Neckar terrace underlying the loess, and (c) example of the wetland habitat cultivated in the quarry.

developed following quarrying, the dumping of the unrequired overburden having provided much of the variable terrain supporting these habitats. The party was joined here by Wolf-Dieter Riexinger from the Heilbronn City Nature Conservation Authority, who is responsible for the management of the site on behalf of the local community. He explained that there is no specific geo-conservation legislation applied to the conservation of this site but its geodiversity value is clearly recognized, as is exemplified by the variety of explanation boards dotted around, revealing the nature of palaeoenvironments indicated by the faunal remains discovered during the excavation of the gravels here (see also Hansch et al., 2009; Rosendahl and Döppes, 2009). The deposits at Frankenbach have long been regarded as equivalent in age to those at Mauer, attributed to the latest Cromerian Complex). The group was able to view the loess exposure from a distance, typically maintained in a near vertical face and revealing the upper two of four recognized palaeosols. Close examination of the underlying gravel was also possible, the platy nature of much of its content revealing bedding and imbrication. Figure 2 shows a representative sample of the different sections of the quarry viewed by the group.

Following the site visit, a picnic lunch was enjoyed amongst flowers and wildlife in the nature reserve

here, with local pretzels and wine from the vineyards at Heuchelberg.

A notable highlight was an afternoon visit to the Urmensch Museum at Steinheim an der Murr, which is dedicated to the discovery in 1933 of a largely intact human skull in terrace gravel of the local Neckar tributary: a specimen that has long been compared closely with the Swanscombe skull from the Lower Thames. Like the ‘Swanscombe skull’ the species represented here is debated; the museum claims it as the holotype for *Homo steinheimensis*, although it is referred to as *Homo heidelbergensis*/‘pre-Neanderthal’ in literature (van Asperen, 2013). DRB had visited this museum previously with a 1996 INQUA field-trip group and noticed some significant changes, not least a splendid life-size reconstruction by Paris-based sculptor Elizabeth Daynès (commissioned in March 2017) of the prehistoric woman; the real skull resides in Stuttgart, although there are two casts of it in this museum (Figure 3). Presentation of the accompanying mammalian fauna has also been enhanced, with reclassification of the mammoth from here to *Mammuthus trogontherii*, termed ‘steppe elephant’ in the German interpretative information. The assemblage also includes *Palaeoloxodon antiquus* (straight-tusked elephant or ‘forest elephant’) and *Bubalus murrensis* (water buffalo).



Figure 3. A cast of the proposed *Homo Steinheimensis* skull and sculpture of what the woman may have looked like. Sculpture by Elizabeth Daynès.

The museum displays reflected recent advances in numerical geochronology (particularly luminiscence and cosmogenic nuclide methodologies) to fluvial sequences – a running theme of the meeting. This saw the age of Steinheim, long attributed to MIS 11, regarded as more likely to date from MIS 9 (Van Asperen, 2013).

After a lengthy but thoroughly worthwhile museum visit, the party returned to the outskirts of Tübingen to look at the Ammer valley, a Neckar tributary that remains idyllically rural despite its proximity to the university town. The Holocene evolution of the Ammer has been studied in detail by K. Johann Holdt, who provided a description of his work on the sedimentary infill of the valley, which incorporates both peats and tufas, the latter yielding an impressive molluscan fauna that includes *Vertigo sp.* There was a lively discussion of the enigmatic juxtaposition of normally acidic peats with calcareous precipitates, DRB noting a comparable occurrence in North Yorkshire in the Snape Mires palaeolake basin (Bridgland et al., 2011). The Ammer and the Snape vicinity have in common, in addition to the peat/shell-marl juxtaposition, the local occurrence of gypsum karst, there being a recently collapsed gypsum doline feature in the Ammer that was examined at close quarters (Figure 4).

On the final day of the meeting, led by Alexander Beer, there was a repeat rendezvous with the coach

and a drive to a different vantage point, this time high on the crest of the Swabian Alb cuesta for a view of deep dissection valleys that eat into the front of the escarpment, as well as outlying ‘witness mountains’ (Figure 5). The latter record the earlier north-westward extent of the escarpment, although some represent Miocene volcanic necks that were once within the cuesta and remain now as upstanding features thanks to their greater resistance to erosion in comparison with the more widespread geological sequence. It was explained that the progressive dissection of the scarp-edge hereabouts has coincided with the loss of catchment area by the Danube to the Rhine, the latter via the Neckar (Beer et al., 2025; Schaller et al., 2025). A FLAG first was the brewing of fresh coffee in the open air, the equipment having been trolleyed from the coach.

A dissected maar lake from the Miocene volcanism, the Randecker Maar, was the second locality, with a view across the former lake basin to the gorge through which it is now drained, as well as information boards depicting a reconstruction based on the Miocene fauna from the lake sediments and the modern wildlife and vegetation that characterize this protected location.

In addition to the ancient volcanism, the cuesta rocks have also been disrupted by two meteorite impacts, also attributed to the Miocene, which have given rise to craters (Eberle et al., 2017). The smaller of these was visited, being easier to appreciate from ground



Figure 4. The view over the Ammer Valley with the collapsed gypsum doline feature in the foreground, including highlighted internal fault structures.



Figure 5. The view from the Swabian Alb cuesta, with the ‘witness mountains’ in the distance (top) and deep dissection valleys. *Photographs courtesy of P. Cunha.*

level. A road closure forced the omission of the drive through the Eyb valley, although evidence for the substantial and rapid incision to be seen there was observed in high-level limestone pinnacles capping the tops of slopes above the forest. Lunch was in the form of a picnic at the Wentaler Felsenmeer, in a dry valley dotted with upstanding dolomite outcrops, seemingly ‘tower karst’ in miniature (Figure 6). There was much discussion about the origin of this unusual geomorphological phenomenon, most interpretations invoking a residual origin, with preferential preservation of more resistant dolomitized limestone. Oligocene gravel was once quarried from the highest plateaux of the Swabian Alb cuesta: the Ochsenberg gravels, thought to represent an early drainage system (the Ur Brenz) flowing to the Danube (Strasser et al., 2010). An old, vegetated quarry was visited and residual sections observed, although these were little more than scrapings and no bedded material could be seen; it was, however, possible to extract a few gravel clasts that were appropriately shaped for a fluvial source.

The final site was Rainau quarry, an operating gravel pit that extracts the Goldshöfer sands (Figure 7), another deposit associated with the former Ur Brenz drainage system flowing to the Danube (Zeese, 1975; Simon, 1996). These deposits, significantly younger than the Ochsenberg gravels, represent the final and best-preserved palaeovalley-fill left by that river. They are probably Lower Pleistocene, as evidence by faunal discoveries that include *Mammuthus meridionalis* and *Cervalces latifrons* (Adam, 1953), although there are potentially later terrace aggradations that date from shortly before drainage hereabouts switched to the Rhine (Strasser et al., 2010). An extensive section here, freshest at the end furthest from the access point, showed a well-bedded, very sand gravel/pebbly sand. Loessic topsoil had been stripped prior to quarrying and was being used for progressive agricultural restoration of the worked-out area.

The party was kept amused for some while studying the exposures and looking for interesting contents of the gravel (Figure 6). Iron and manganese staining was noted and the largest gravel clasts examined included



Figure 6. The impressive dolomite outcrops at Wentaler Felsenmeer – note the people on the left-hand side for scale! *Photograph courtesy of P. Cunha.*



Figure 7. Rainau quarry sections showing exposures of the Lower Pleistocene Goldshöfer sands. *Photographs courtesy of P. Cunha.*

ironstone (some of 'boxstone' type) and cherts, the latter potentially including celebrated multicoloured 'Keuper flint' (actually chalcedony) from the Triassic (Schüssler et al., 1999; Schüssler, 2015). Part of the outcrop, to the south of the Rainau quarry, is identified as the Goldshöfer Sands Nature Reserve (Goldshöfer Sande Naturschutzgebiet), located in the Aalen–Ellwangen–Abtsgmünd area, protecting the Quaternary deposits as well as the habitats and landscapes formed on them (State Institute for the Environment Baden-Württemberg, 2000).

After votes of thanks to the leaders of the meeting and field trip as the party left the final site, the journey back to Tübingen was rather impeded by late weekend traffic.

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