Yearly reports on the project are published in *SLSA-Jahresbericht*; they are also downloadable as PDF files from: [http://www.slsa.ch/Projekte/QasrAl-HayrAl-SharqiE.htm](http://www.slsa.ch/Projekte/QasrAl-HayrAl-SharqiE.htm)

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**Landscape Study at Andarin, Syria**
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Due to various circumstances, our second season of landscape study around Andarin (ancient Androna) carried out in September 2006 concentrated on two surveys, while continuation of the type of site surveying done during our 2005 season was postponed until later. The 2006 team consisted of Dr Marlia Mango, Professor Robert Hoyland, Alex Johnson, Bruce Magee, Khalid Mohammed, and Dr Lukas Schachner. Fieldwork data was later processed by Theo Papaioannou and Priscilla Lange. The geophysical survey by magnetometer was carried out by Alex Johnson with the help of Khalid Mohammed at two reservoirs, Umm al-Jurun and within Andarin. The other survey, conducted by Bruce Magee and Lukas Schachner, recorded water flow levels for a study of the irrigation water supply to be carried out later by Dr Rachael McDonnell. As part of our landscape study, Robert Hoyland continued his work on topography and conducted taped interviews on local settlement and agricultural practices. He also briefly explored the 10 km long basalt north–south djebel on the west side of our study area, in anticipation of a fuller future investigation.

1. **Qanat no. 4, leading to the northwest reservoir**
During our Landscape Study we have identified at least six groups of *qanats* in our area. In addition to the southeast and northwest reservoir *qanats* (nos. 4–5),
there are four other systems: one to the north with two reservoirs (no. 6) and another three to the west at Homeh, Halabiya and Dekk with no identified reservoirs (nos. 1–3). One north qanat flows east to west from springs 6.5 km distant. The other qanats flow south to north, except for secondary branches. The northwest reservoir qanat (4–5 km long) and the parallel qanat running to the east of Homeh may originate at the base of the limestone hill that rises between them, as suggested by satellite images. Two other qanats (no. 2 and the west part of no. 3) possibly originated at the base of the basalt djebel. Some qanats (nos. 2–3) partly become open ditches.

In 2005, Robert Hoyland, walking with a hand-held GPS, plotted the main parts of qanats nos. 2–4 (see CBRL Bulletin 1 (2006)). This work was eventually supplemented by Lukas Schachner on our Oxford computer using Google Earth, as shown on the map here. Our 2006 irrigation survey took levels to record the flow of water within one qanat and two reservoirs. As part of this work, new benchmarks were established for this and future survey work, linking current and previous survey work done in three different locations. For the 2006 season, we decided to concentrate on the south–north qanat no. 4. This qanat is the one closest to Andarain itself and would therefore probably represent an original phase of irrigation installation. There are three other reasons for this choice: (1) it led to the excavated northwest reservoir which in turn delivers water to a property with an imperial boundary stone; (2) it includes an intersection with a short east–west qanat branch which would be interesting to record; and (3) it appears to have originated within our study area, unlike qanats nos. 5–6.

For the survey, we took upper surface levels along the extent of qanat no. 4, particularly between Andarain and its reservoir. We also took lower surface levels within four vertical shafts: one (shaft 4) within the southwest leg, one (shaft 1) near the terminus of the east–west branch at Sammaqiyya, one (shaft 3) at the intersection of this branch and the main qanat, and one (shaft 2) near the northwest reservoir. In addition to reading levels, we recorded the visible features of the shafts and, where they were examined in depth, the connecting tunnel between them, including, for
hole at floor level led into a lower channel, directly under an open overflow channel. In 2002–3, the lower stone channel was traced by trenches at various intervals up to nearly a km away (20, 100, 200, 700, 972 m). Given the long distance the water travelled, we wished to know if any openings along the way or any lateral channels branching off this line delivered water to the closer fields. Our 2006 geophysical survey revealed that the upper overflow channel turned in a diagonal direction eastward and was probably used to water the nearer fields, together with the parallel diagonal channel also branching eastwards off the reservoir’s inlet.

Also in 2006, we verified and extended the levels previously taken within the northwest reservoir that reveal a shallow basin slightly sloping to the north, between inlet and outlet. This information, combined with the levels taken within qanat no. 4 at shafts nos. 2–4 and those taken for the upper and lower outlet channels of the reservoir extending to Umm al-Jurun, established a comprehensive picture of water flow over nearly 6 km.

3. The southeast reservoir
Unfortunately, the main outlet of this reservoir was removed, apparently in modern times, together with the central section of the wall in order to construct a gravel ramp, probably to let animals enter to graze inside. Although any remains of the outlet channel had heretofore proved elusive, our 2006 geophysical survey located it at about 40 m northwest of the reservoir outlet wall and traced its underground course for up to 300 m as it continued to the northwest. In 2006 we also verified and extended previous recordings of water levels at the reservoir as part of our general study. We have thus built up over several seasons a complex picture of water flow at this reservoir. We have previously established (2002–5) that the inlet channel running from qanat no. 5 empties first into a settling pool above the reservoir, from which branched two lateral channels which apparently irrigated fields close to the reservoir. After nearly 150 m, one of these channels emptied into a shallow basin near the reservoir’s west corner, and photographic evidence exists that a canal once ran between this pool and the area of qanat no. 4 to the west (see CBRL Bulletin 1 (2006): 46–47).

Fineware pottery collected in 2005 on the outlet side of the reservoir supported a radiocarbon dating of its construction to the sixth–seventh century, read on charcoal in a cement sample removed from the reservoir floor. Additional samples for further analysis to confirm this dating are being sought both in the reservoir and in the kilns used to produce its construction cement which are located east of the inlet channel. Although we excavated three of these kilns in 2002–3, others proved difficult to locate within a large area covered with slag. In 2006, Alex Johnson’s magnetometer revealed eight to nine kilns that had been built in a straight line, facing west to pick up the prevailing wind. This discovery adds...
another note to our understanding of the construction organization of the qanat/reservoir system and will facilitate future excavation of the kilns.

4. The two baths at Andarin and Jacob’s martyrion

Two further geophysical readings in 2006 sought to locate unexcavated construction at Andarin itself and at Umm al-Jurun near the northwest reservoir. Two baths are known at Andarin, a Byzantine bath built by one Thomas in c. 560 which we excavated in 1998–2001 and an Umayyad bath excavated by our Syrian colleagues, directed first by Dr A. Zaqzuq and subsequently by Dr R. Ougdeh. Water was supplied to the Byzantine bath by a well situated in the service area on its west side and by a cistern located in the entrance court to the east. The later bath, having a plan very similar to that of the earlier bath, was built a short distance downhill from it, but with no obvious water supply source of its own. In 2006, Dr Ougdeh uncovered water channels at the corner of the Umayyad bath closest to our bath, from where our magnetometer traced a diagonal line, possibly that of a water channel, running uphill towards the well of the Byzantine bath.

As stated above, irrigation water was led from the northwest reservoir c. 1 km in the direction of Umm al-Jurun where stood an imperial boundary stone set up in the names of Justinian and Theodora (hence 527–48) to mark the property ‘of the martyr Jacob’. The stone was discovered near a mounded area, strown with architectural material, which may be the collapsed martyrion of Jacob (see CBRL Bulletin 1 (2006): 48). The mound appears to contain what may be a large centralized building of massive construction, suggesting a church, possibly domed. The conditions of our permit do not allow us to investigate beneath the surface, so in 2006 we carried out geophysical survey over the main part of the mound. The loose architectural pieces on the surface are basalt, with the exception of Proconnesian marble slab carved with a cross. The amount of building material collapsed across the structure within the mound probably prevented a clear ground plan emerging in the survey which did confirm, however, the presence of a building.

Conclusion

The geophysical survey carried out in 2006 clarified key points concerning the delivery of water at both excavated reservoirs, it revealed the exact location and configuration of a series of kilns at one of them, and it provided evidence within Andarin of the eventual diversion of the Byzantine bath’s water supply to the Umayyad bath. The water level survey gathered data essential for a specialist study of the irrigation system as it operated in both qanats and reservoirs. All this information will contribute to our understanding of the chronology and means by which Andarin expanded to an unprecedented size for a kome (see CBRL Bulletin 1 (2006): 48–49).

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**Investigations of Euphrates terraces and related archaeology, NE Syria, 2006-2007**

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Over the years, the terrace deposits of the River Euphrates in NE Syria have served as prolific sources of Palaeolithic artefacts, from a large number of sites. In a pilot project in 2003, funded by the CBRL, we obtained samples from basalt flows that crop some of these terrace deposits; this work (Demir et al. 2007) has enabled, for the first time, these terrace deposits to be reliably dated, using the Ar-Ar technique. Further CBRL funding, combined with logistical support from collaborating Syrian institutions, has now enabled new investigations of this critical study locality. In addition to collecting further samples of basalt, and of fluvial sediment, for dating, we have used differential GPS to determine accurate heights for many of the Euphrates deposits, including those that have yielded Palaeolithic artefacts. No archaeological prospecting was carried out during this project, but occasional artefacts were encountered during the inspection of geological sections. With the agreement of the relevant Syrian authorities these have been retained for future study and in the meantime are in temporary storage at the National Earthquake Center in Damascus.

It will take many months to fully analyze the dataset collected. In the meantime, some preliminary conclusions can be drawn, although these are subject to change pending complete analysis of the data. We express our findings in terms of the terrace scheme that has been established over many years through work by French archaeologists (e.g. Sanlaville 2004: 115–133). First, an important constraint on the Euphrates chronology is provided by the basalt at Zalabiyyeh dated by Demir et al. (2007) to 2116±39 ka (±2σ). We have now traced this basalt flow to its distal limit, where it overlay the contemporaneous river channel, and surveyed the contact between its base and the underlying fluvial sediment at 251 m a.s.l. or ~40 m above the present level of the modern river nearby. Second, it is clear from existing evidence, discussed by Demir et al. (2007), that in this region, early in the Early Pleistocene, the Euphrates incised to a typical level of ~30 m below its present level, then aggraded back in the late Early Pleistocene to several tens of metres above its present level, forming a fluvial deposit up to ~50 m thick, known as terrace QfII. The upper surface of the deposits assigned to this terrace can be identified in many localities; for instance, it is ~30 m above the Euphrates at sites about halfway between Raqqa and Zalabiyyeh. This terrace cannot be traced in the constricted reach of the Euphrates valley between the Halabiyyeh and Zalabiyyeh basalt plateaux, but reappears a short distance farther downstream where it is ~35–40 m above the river (e.g. at Bweitiyyeh and at Kasra). Over the ~30 km distance from these localities to Deir ez-Zor, this terrace converges slightly downstream with the river, such that at the key Palaeolithic sites of Ain Abu Jemaa (the terrace ‘type locality’) and Hawi Magharat, the two are ~25–30 m apart. The oldest Euphrates terraces are much higher above the river in the vicinity of the Halabiyyeh and Zalabiyyeh plateaux than elsewhere in the region; some are indeed back-titled in this area, such that their height above sea-level increases downstream. As Demir et al. (2007) noted, such warping can be presumed to relate to local deformation of the crust. This reach of the Euphrates indeed transects the Jebel Bishri mountain range, across which a small component of the northward motion of the Arabian Plate relative to Eurasia appears to be accommodated by shortening and local upwarping of the crust. The downstream variation in height of terrace QfII may reflect the same process, but whether it can be demonstrated from variations in the heights of the younger terraces must await detailed examination of the data. Such localized variations in the height of Euphrates deposits greatly complicate the analysis process, although these variations are of fundamental importance to our Syrian co-workers, as they can be used to estimate rates of active faulting and thus to quantify the earthquake hazard in the region.

The Palaeolithic artefact assemblages from this region (e.g. Copeland, 2004) can be summarized in terms of three groupings (Demir et al., 2007). First, non-hand axe assemblages, consisting of flake and core artefacts and typically with a strong patina, have been reported at sites previously assigned to terrace QfIII, notably Hawi Magharat, Kasra Qaracol, Madan 1,3,5, and Chinheh East 3. However, we do not consider patina as an unequivocal indicator of age, and we also do not think it appropriate to use the absence of handaxes for classification. Many hundreds of them have been reported at sites in the Euphrates in NE Syria (Copeland 2004), but we found only one during this entire