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PLANT REMAINS FROM AN APOLLO GRANUS SANCTUARY AT NEUENSTADT AM KOCHER, BADEN-WÜRTTEMBERG

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INTRODUCTION, ARCHAEOLOGY

Between 2007 and 2011, the Landesamt für Denkmalpflege excavated, under the direction of the second author, in Neuenstadt am Kocher, county of Heilbronn, Baden-Württemberg, an Apollo Grannus sanctuary (Kortüm 2008, 2009, 2010, 2011, 2012, 2013, 2014) (fig. 1, 2). This temple had a size of 18 x 20.3 m, and was a spring or fountain sanctuary. The spring tappings were two hexagonal bowls (fig. 3). Each had a diameter of about 3 m and a wall and foundation made of stone (fig. 4). The surroundings of these basins, situated directly outsite of the temple building, were paved with large stone plates (fig. 5). The archaeobotanical study focused on the filling of the spring tappings, which was waterlogged and rich in wet preserved organic material.

THE SITE

Neuenstadt is situated ca. 10 km behind the limes, in the fertile valleys of the rivers Kocher and Jagst. Ahead of the city the Roman border controls the Hohenlohe plain, an important transit corridor connecting the Neckar valley with central

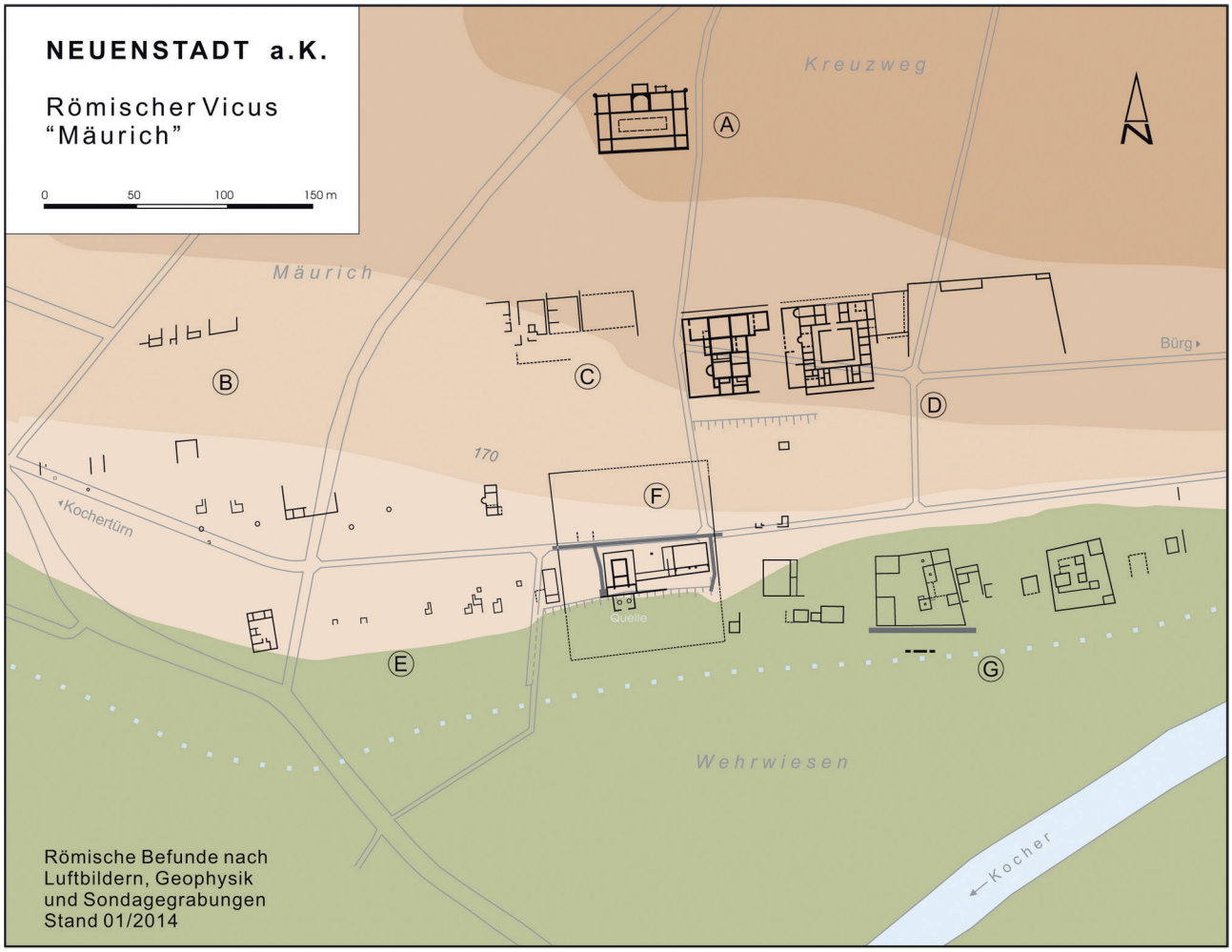

Fig. 1 - Plan du *vicus* de Neuenstadt, "Mäurich" (Baden-Württemberg).

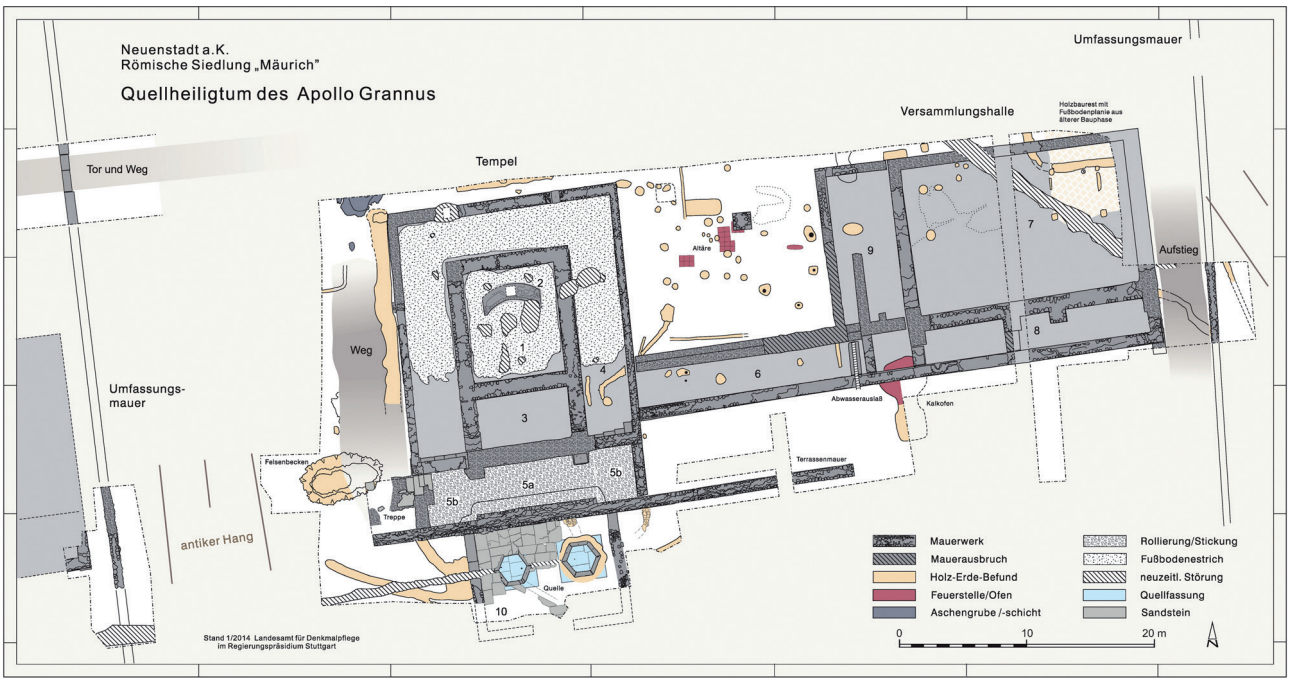

Fig. 2 - Plan du sanctuaire de source d'Apollon Grannus, *vicus* de Neuenstadt, "Mäurich".

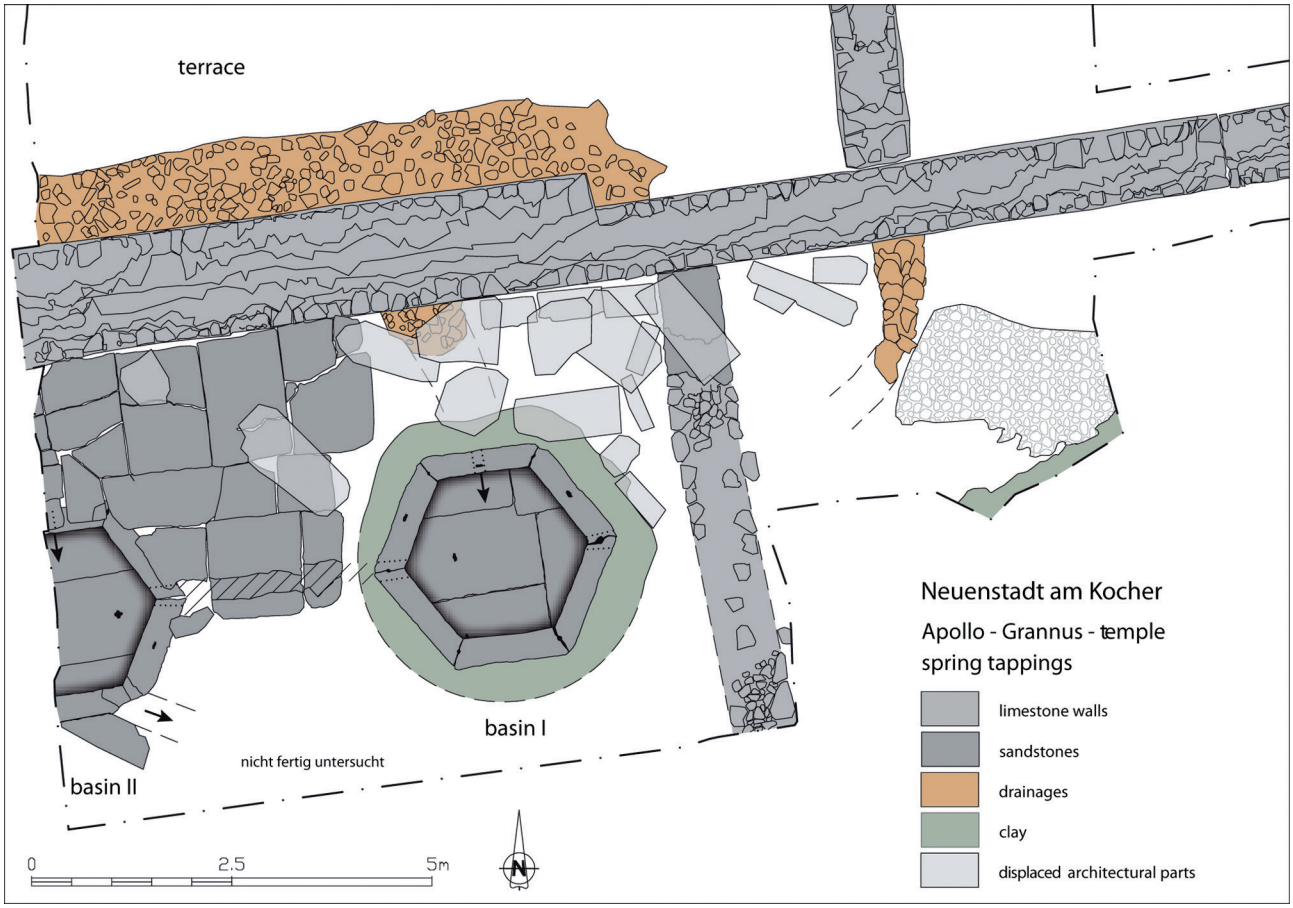

Fig. 3 - Plan de détail des bassins de captage de source, *vicus* de Neuenstadt, "Mäurich".

Fig. 4 - Vue de l'un des bassins de captage, de forme hexagonale.

Fig. 5 - Vue de l'un des bassins de captage, et du pavement de ses abords.

Germany, between the forts of Osterburken and Öhringen. This border section has a total of four cohorts and two *numerus* forts, which represents the densest concentration of troops on the later course of the Upper German Limes, resulting from the geographical importance of this region.

Our knowledge of the site, which has never been build over, is mainly based on aerial photography and geophysical survey (fig. 1). The ancient settlement (*vicus*) was situated in the Kocher valley, on a south-facing slope, and stretches over several terraces from the river plain up to the plateau. Nevertheless, a dense and regular pattern of buildings suggests a mostly orthogonal road system. Design, extent, and character of the settlement evokes a function as a town-like centre, and probably Neuenstadt, and not Öhringen as previously supposed, was the long-sought capital of the Civitas Aur(elia) G() to the east of the Neckar. Epigraphic evidence for the Civitas comes from Neuenstadt itself and the surrounding area. Apparently the capital was founded as a purely civilian settlement and administrative centre about AD 160 when the Neckar limes was abandoned and the frontier was moved forward to Osterburken, Öhringen etc.. After only 100 years, the site has to be vacated when the Upper German – Raetian *limes* was overrun (Kortüm, op. cit).

THE TEMPLE

A sacred precinct (ca. 90 x 100 m) forms the settlements's centre (fig. 1f). Here the large temple complex for Apollo Grannus was situated, towering above the plain.

The partly exceptionally well-preserved building consisted of a so-called "classicising" Gallo-Roman temple (mixture of the standard type with a Mediterranean style podium temple) and a hall-like annex that was connected to the temple by a covered walk-way (fig. 2, 3). Ahead of the temple front was an open terrace with a parapet wall. A sacrificial site with several fireplaces was located laterally in the space between temple and annex. For the construction of the temple complex, the hillside was terraced and supported by retaining walls, so that a podium could be established. The sanctuary was dedicated to Apollo Grannus as indicated by fragments of statues found in the building rubble and by earlier discovered inscriptions from the site (CIL XIII 6463, 6464), also demonstrating the importance of the cult to the ancient city.

THE SPRING TAPPINGS

Two spring boxes made of large blocks of sandstone lay directly in front of the podium in an open courtyard (fig. 3, 4). The adjoining structures could not be excavated. Completely buried in the muddy ground, the basins used water that emerged at the foot of the slope and soaked the ground area. On all sides water seeped into the basin through special holes and the gaps between the massive stone blocks. Drainage areas composed of rubble stones in some areas uphill of the basin were used to improve the water collection. The inflows were level with the floor of the basin, the effluent was evacuated through overflow channels.

According to stratigraphic evidence, the spring tappings were built simultaneously with the stone temple, probably at the end of the second century. There is evidence of earlier constructions for both the spring tappings and the temple, whose exact appearances however are unknown.

The basins were kept continuously clean throughout their period of use. Only a thin layer of sand was found on the bottom of the basins, which resulted from the natural weathering of the above-ground portions of the stones of the basins. Above this sand followed the main filling. Two layers can be distinguished: The lower part primarily consisted of earth in which some brick fragments and worked stones were incorporated. In addition organic material including thin wood fragments,

apparently originating from branches, and similar debris was observed (fig. 5). This mixture was followed by a layer primarily consisting of material of the destroyed temple. This layer also covered the floor of the courtyard around the basins and extended over the whole area in front of the temple (fig. 4). Inside the basins, whose soft bottom fillings had been constantly moist until the excavation time, the layer has sagged slightly. The uncovering of the ancient spring tappings was only possible by constant pumping of the inflowing water (fig. 5).

The inclusion of larger architectural elements indicates that the lower infilling was also not simple the result of natural processes, but that at least parts of the basins must have been filled in intentionally AMS data (see below) and the surprising discovery of a coin from AD 275/276 indicate that the infill might have been taken place immediately after the abandonment of the limes (AD 260 or a little bit later), which also marked the end of the Roman era for the area around Neuenstadt (Kortüm 2014a). Weather after this event some Romans continued to live in Neuenstadt is archaeologically still unexamined, as is the question of the arriving of the first Germanic settlers. Arguably the temple must have suffered a first serious destruction before the end of the third century.

As a consequence of this the organic remains of the basins belong to the historically significant phase of transition from the Roman to the Alamannic period, when the central sanctuary of Neuenstadt had lost its function and stood as a ruin in the midst of an abandoned temple precinct. The latter appears to have been largely left to itself so that nature could gradually retake possession of the site. At present it remains unclear who filled in the basins and lost the coin, and what the reason for this "tidying up" was. According to current research "Romani" as well as "Alamanni" may have been responsible for the loss (Kortüm 2013), as, in the former *agri decumates* coins embossed after AD 250 are not uncommon in purely Germanic settlement contexts of the later third and fourth centuries (Sommer 2014).

CHRONOLOGY

According to the archaeological findings, the spring tappings were in function at least until the middle of the third century A.D., when the region was occupied by Alamannic tribes. In order to obtain a more precise age, four samples from the first tappings filling were taken and AMS-dated in the Klaus Tschira laboratory in Mannheim. For the dating, isolated and selected fruits and seeds of Corylus avellana and Sambucus nigra and racemosa were used. These were the results (tab. I).

Three of the four data, in spite of being taken at different depths of the filling, are chronologically overlapping, which is no big surprise, because we can assume, that the filling up of the basins with litter, after they lost their function was a short-time event, most probably not lasting many years. This point of view is supported by the fact, that the bottom date is the younger one. We can therefore conclude that the filling time of the lower part of the sediment corresponds to the overlap time of the three data (fig. 6), resulting in a filling time of either AD 260-280 or 320-340. The upper part of the basin was most probably filled later, towards the end of the Migration or in the early Merovingian period.

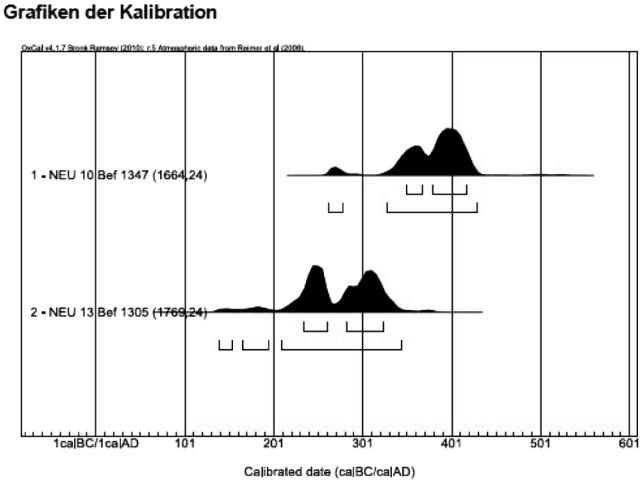

Fig. 6 - Graphique de calibration des datations radiocarbonne, échantillons pris à la base du comblement des bassins

Labor No. MAMS	Sample	C14 Age	±	13C	Cal 1 sigma	Cal 2 sigma
15903	1 - NEU 10 feature 1347	1664	24	-18,2	cal AD 351-417	cal AD 264-428
15904	2 - NEU 13 feature 1305	1769	24	-21,2	cal AD 235-323	cal AD 140-343
18474	NEU 14 feature 1305, upper part of core	1581	17	-22,8	cal AD 432-533	cal AD 428-536
18475	NEU 13 Bef. 1305, lower partof core	1687	17	-34,0	cal AD 342-395	cal AD 262-412

Tab. I - Datations radiocarbonne du comblement des bassins.

Archaeobotany

Plant macrofossils

The filling of both basins was investigated archaeobotanically, looking for fruits and seeds, as well as for pollen. All plant remains were uncharred and wet preserved.

From seven samples with a total volume of 10.3 litres, 9578 plant remains were isolated and determined (tab. II). The concentration of fruits and seeds in the samples was between 79,8 and 2210 items per litre. This is a medium value, indicating, that the litter was not pure organic material, like a cesspit filling, but of mixed origin. The 104 identified *taxa* can be grouped ecologically, starting with the useful plants. This grouping does not imply that the crops and other wild plants cannot be also useful and were perhaps used as well, but as we have no proof for use, we do not group them with the useful plants. This grouping as not used applies primarily to species which can be used as medical plant, spice or vegetable, whereas for fruits and nuts we assume the use for food.

Fruits and nuts are most common among the useful plants. Different species of *Rubus* and *Sambucus, Corylus avellana, Prunus spinosa, Cornus sanguinea, Rosa, Physalis alkekengi, Fragaria, Malus and Crataegus laevigata* occur, partly in several samples and in big amounts. All these fruits and nuts can be gathered in the wild. The only species for which cultivation is probable is Malus. One oil- and fibre plant and three spices occur. Among them two were surely cultivated : *Cannabis sativa* and *Piper nigrum*. Whereas *Cannabis sativa* was most probably cultivated locally, as other finds from this period in the region confirm (Rösch 2008), *Piper nigrum* must have been imported. *Humulus lupulus* and *Carum carvi* grow wildly in this region, but the large number of items of both prompts us to group them with the useful plants.

Other crops, especially cereals, are totally lacking in this material.

POLLEN ANALYSIS

Five samples for pollen analysis were taken, three from different features of the filling of basin I, one from the filling of basin II, and one near basin II. Each sample had a volume of 6 ml and was prepared for pollen analysis in the usual way (Berglund 1986) with the additional counting of *Lycopodium* spores to calculate the pollen concentration. Micro-charcoal was also registered quantitatively. The results are displayed as counts and concentration in tab. III and as percentages in tab. IV.

In total, 2560 pollen grains were counted, resulting in 81 pollen types.

Sample 24 was originally taken on the outside of basin I in order to carry out wood analysis. In this sample the sum as well as the concentration of pollen is very low, in spite of wet preservation. Therefore, this material must have been more or less free of pollen and must have been deposited in a very short time without input of the natural pollen rain from the air. The other samples have pollen/spore concentrations between about 4000 and 70.000. This is quite similar to the pollen content of peat or lake sediments (Birks 1986, Seppä *et al.* 2009). The pollen preservation is medium to excellent, and hints of selective pollen corrosion are lacking. Trees and shrubs are most frequent, and therefore this pollen content could represent the natural pollen rain. The differences can be caused by different exposition time of the material. For example, the pollen content of 4 340 grains per ml in sample 20 can represent the pollen deposited during one year or even less, whereas a pollen content of about 72000 grains can represent the pollen rain of ten years ore even more.

Trees and shrubs have percentages of about 70 %, the NAP respectively about 30 %. This indicates a rather open landscape, but perhaps the NAP are enriched by local anthropogenic input. The tree pollen spectra are dominated by *Pinus*, a strong argument against natural regional pollen influx, because in this period the forest was dominated by *Fagus, Quercus*, and *Carpinus*, as well as by *Alnus* in wet places (Rösch 2013, Smettan 1990). But looking at the average values, put together as a sum, these arboreal pollen types do not exceed *Pinus*. Other forest trees, as *Abies, Acer, Fraxinus, Ulmus, Tilia, Picea*, are seldom. The four components of the Mixed-Oak forest grew locally, whereas the conifers were transported from bigger distances, *Abies* from nearby mountains, *Picea* from even farther distance. As there is no evidence for selective pollen corrosion, perhaps single local stands of *Pinus* are responsible for the high values.

Shrubs sum up to be nearly as abundant as trees, and in the samples 21 and 22 even dominating. This is caused by big amounts of *Corylus*. These two samples have the highest pollen concentration. Clumps of *Corylus* pollen indicate local input, perhaps as catkins attached to twigs. Therefore the shrubland cover of the landscape should not be overestimated. Among the shrub pollen there are several species which are also indicated in the macrofossil record, as *Sambucus, Betula, Cornus sanguinea* and *Viburnum*.

period			MP	MP	MP	MP	MP	MP	MP		sum	short time
site type			temple	temple	temple	temple	temple	temple	temple			
feature type			basin	basin	basin	basin	basin	basin	basin			
sample type			bucket	bucket	bucket	bucket	bucket	bucket	bucket			
sample volume (l)			1,3	1,24	déc.-99	1,2	2	1,45	1,15			
feature			1305	1305/1347	1347	1347	1347/1356	1364	1 370			
sample no.			1	2	4	10	3	7	9			
edible plants	Öko	RTyp										
Cannabis sativa	5	Sa/Fr			1					1	1	X
Piper nigrum	5	Sa/Fr			1					1	1	
Humulus lupulus	5	Sa/Fr					90			90	1	X
Carum carvi	43320	Sa/Fr					10			10	1	
Sambucus ebulus	5	Sa/Fr	3		24	18	39	8	7	99	6	
Rubus idaeus	5	Sa/Fr	2		4	9	8	1	2	26	6	x
Corylus avellana	5	Sa/Fr	66		35	43	113	1		258	5	X
Cornus sanguinea	5	Sa/Fr	10		85	15	111	4		225	5	X
Rubus fruticosus	5	Sa/Fr	4		13	5	30	7		59	5	x
Sambucus	130000	Sa/Fr		3		45	20	30	5	103	5	X
Sambucus nigra	5	Sa/Fr	89			68		48	45	250	4	X
Prunus spinosa	72000	Sa/Fr	3		16	3	17			39	4	X
Sambucus nigra/racemosa	5	Sa/Fr			194		178	181		553	3	X
Rubus caesius	5	Sa/Fr			15		30	1		46	3	x
Physalis alkekengi	31210	Sa/Fr			2	2	20			24	3	
Fragaria	5	Sa/Fr	1	1		7				9	3	x
Rosa	5	Sa/Fr					46	4		50	2	
Crataegus laevigata	5	Sa/Fr			6		9			15	2	x
Malus	130000	Sa/Fr					2			2	1	x
Malus	13000	Fr					5			5	1	x
crop weeds, all soils												
Solanum nigrum	21000	Sa/Fr			20	2	30			52	3	
Sonchus asper	21000	Sa/Fr		2	9		20			31	3	x
Chenopodium album	21000	Sa/Fr		2			2	5		9	3	x
Stellaria media	21000	Sa/Fr					10	5		15	2	
Papaver dubium/rhoeas	21000	Sa/Fr		16						16	1	
Polygonum convolvulus	21000	Sa/Fr					1			1	1	
crop weeds, acidic soils												
Galeopsis cf. tetrahit	21112	Sa/Fr					5	3		8	2	x
Chenopodium polyspermum	21132	Sa/Fr		1		1				2	2	x
Lapsana communis	21112	Sa/Fr					170			170	1	x
Papaver argemone	21112	Sa/Fr					10			10	1	
crop weeds, basic soils												
Chenopodium hybridum	21210	Sa/Fr					10			10	1	x
Alopecurus myosuroides	21200	Sa/Fr						1		1	1	x
Aethusa cynapium	21210	Sa/Fr						1		1	1	
Anagallis arvensis/foemina	21210	Sa/Fr				1				1	1	

Tab. II - Macrofossiles observés dans les échantillons prélevés dans les deux bassins.

foodpath communities												
Rumex obtusifolius	43200	Sa/Fr				1		2		3	2	x
Juncus cf. inflexus	43200	Sa/Fr						175		175	1	
Mentha cf. longifolia	43200	Sa/Fr						140		140	1	x
Poa cf. trivialis	43200	Sa/Fr						80		80	1	x
Carex hirta	43200	Sa/Fr						70		70	1	x
Potentilla reptans	43200	Sa/Fr					10			10	1	x
Polygonum aviculare	22000	Sa/Fr	1							1	1	X
Juncus bufonius	23000	Sa/Fr							1	1	1	
Plantago major	43200	Sa/Fr				1				1	1	X
Rumex crispus	43200	Sa/Fr						1		1	1	x
Rumex obtusifolius	43200	Perig.						1		1	1	x
ruderals												
Urtica dioica	31200	Sa/Fr	19	11		137	1960	520	4	2651	6	x
Solanum dulcamara	31200	Sa/Fr			16	1	130	11	2	160	5	X
Chelidonium majus	31210	Sa/Fr	3	4				96	4	107	4	
Moehringia trinervia	31210	Sa/Fr	10			12	80	5		107	4	
Bryonia dioica	31210	Sa/Fr			8		2			10	2	
Pastinaca sativa	31110	Sa/Fr					10			10	1	
Ballota nigra	31120	Sa/Fr						5		5	1	
Verbascum thapsus	32200	Sa/Fr						5		5	1	
Artemisia vulgaris	31000	Sa/Fr							2	2	1	X
Galeopsis bifida/tetrahit	130000	Sa/Fr			2					2	1	x
Melilotus	30000	Sa/Fr				1				1	1	
Cuscuta europaea	31220	Sa/Fr							1	1	1	
grassland												
Arenaria serpyllifolia	41100	Sa/Fr					20			20	1	
Carex ovalis	51000	Sa/Fr						7		7	1	x
forest fringes												
Hypericum perforatum	61000	Sa/Fr						175	5	180	2	x
Agrimonia eupatoria	61000	Sa/Fr						2		2	1	X
Origanum vulgare	61000	Sa/Fr							1	1	1	
forest, shrubland												
Clematis vitalba	72000	Sa/Fr			13	1	30	25		69	4	
Quercus	80000	Sa/Fr	4			3	16			23	3	X
Carpinus betulus	85120	Sa/Fr	8		1		4			13	3	X
Betula pendula/pubescens	70000	Sa/Fr					10			10	1	X
Quercus	80000	Fr				9				9	1	X
Scrophularia nodosa	85130	Sa/Fr						5		5	1	
Stachys sylvatica	85130	Sa/Fr						4		4	1	
Abies alba	85100	leaf					2			2	1	X
Betula pendula	70000	Sa/Fr	1							1	1	X
Viburnum	130000	Sa/Fr			1					1	1	X

Tab. II (suite) - Macrofossiles observés dans les échantillons prélevés dans les deux bassins.

wetland												
Nasturtium officinale	92100	Sa/Fr					280	100	1	381	3	x
Scirpus sylvaticus	43330	Sa/Fr						1690	18	1708	2	x
Juncus	130000	Sa/Fr					10		4	14	2	
Juncus articulatus	93000	Sa/Fr	1						1	2	2	
Juncus conglomeratus/effusus	43330	Sa/Fr							34	34	1	
Valeriana	130000	Sa/Fr					30			30	1	
Carex cf. acutiformis	93200	Sa/Fr						15		15	1	x
Scirpus	130000	Sa/Fr							4	4	1	x
Valeriana dioica/officinalis	130000	Sa/Fr			2					2	1	
Ranunculus aquatilis	107000	Sa/Fr				1				1	1	x
indifferent												
Apiaceae	130000	Sa/Fr			2				1	3	2	x
Asteraceae	130000	Sa/Fr					10			10	1	x
Carex tricarpellat	130000	Sa/Fr						30		30	1	x
Carex	130000	Sa/Fr				1		55		56	2	x
Chenopodium	130000	Sa/Fr		1						1	1	x
Epilobium	130000	Sa/Fr	5				570	160	4	739	4	
Euphrasia/Odontites	130000	Sa/Fr				3		5		8	2	
Fragaria/Potentilla	130000	Sa/Fr								1	1	
Myosotis	130000	Sa/Fr					20			20	1	
Poa	130000	Sa/Fr		12			80	100		192	3	x
Poaceae	130000	Sa/Fr	2				30		1	33	3	x
Ranunculus subgen. Ranunculus	130000	Sa/Fr	2	1				2		5	3	x
Rosaceae	130000	Sa/Fr				1				1	1	x
Rosaceae	130000	spine					50			50	1	x
Rumex	130000	Sa/Fr			19	3	80			102	3	x
Sanguisorba	130000	Sa/Fr				1				1	1	
Scrophularia	130000	Sa/Fr	6	45						51	2	
Veronica	5	Sa/Fr							1	1	1	
sum			241	99	489	395	4420	3786	148	9778		
number of taxa			21	12	23	28	47	43	22	100		
concentration					265,8		2210,0					
X	same identification level											
x	lower identification level in the pollen record											

Tab. II (suite) - Macrofossiles observés dans les échantillons prélevés dans les deux bassins.

Neuenstadt am Kocher **sample** **feature** **area**	20 1 457 U20a1	21 1 308 T20b	22 1 308 T20b	23 1 841 T20b	24 1 891 T20b U20a	sum
excavation diary no.	1 252	1 856	1 845	1 847	1 949	
plane	4-5		2-3	above 3		
basin		II	II	II	by I	
forest						
Pinus sylvestris	41	39	37	80	4	201
Quercus	7	43	44	91	2	187
Alnus glutinosa/incana	23	37	39	42	2	143
Fagus sylvatica	13	21	22	29		85
Carpinus betulus	4	9	12	7		32
Abies alba		5	4	3		12
Acer		5	5	2	1	10
Fraxinus excelsior		1	6	3		10
Picea abies			1	5		6
Ulmus			1	1		2
Tilia	1					1
shrubland						
Corylus avellana	21	307	494	118	2	942
Betula	1	18	55	27		101
Salix		26	20	18		64
Sambucus nigra/racemosa		7	9	13		29
Juniperus communis			2	3		5
Populus		1	3			4
Cornus sanguinea		1				1
Viburnum opulus			1			1
crop weeds						
Mercurialis annua		1	1			2
Achillea T	1					1
Bupleurum				1		1
ruderal						
Artemisia		16	30	12		58
Daucus carota	1	7	3	3		14
Rumex undiff.	1	5	4	3		13
Chenopodiaceae		4	2	4		10
Urtica/Parietaria		1	8			9
Plantago maior	1		2	1		4
Torilis japonica			2	1		3
Chaerophyllum hirsutum T			1	1		2
Carduus				1		1
Cirsium	1					1
Echium				1		1
Galeopsis T				1		1
Polygonum aviculare					1	1
Solanum dulcamara				1		1

Tab. III - Pollens identifiés dans le remplissage des bassins I et II ainsi que dans un échantillon prélevé aux abords du bassin II (comptages), avec également les charbons de bois.

grassland, fallow land						
Poaceae undiff	11	45	39	28	3	126
Plantago lanceolata		2	7	5		14
Heracleum sphondyleum				2		2
Centaurea jacea T				1		1
Medicago lupulina T			1			1
Pimpinella saxifraga T			1			1
Plantago media					1	1
wetland						
Cyperaceae undiff	3	6	2	7		18
Filipendula		5	4	6		15
Angelica sylvestris				2		2
Caltha T		1				1
forest fringes, heathland						
Polypodiaceae undiff	10	11	8	22		51
Calluna vulgaris			1	2		3
Hypericum perforatum T		2		1		3
Agrimonia eupatoria T				1		1
Anemone nemorosa T			1			1
Anthriscus sylvestris				1		1
Pteridium aquilinum	1					
open land in general						
Cichoriaceae	25	2	3	15	2	47
Apiaceae undiff.		3	1	4		8
Brassicaeae		1	4	3		8
Rubiaceae		3	1	3		7
Ranunculus acris T	1		3	1		5
Varia		2	1	2		5
Mentha T		1	1	1		3
Potentilla T			1	1		2
Ranunculaceae undiff.		2				2
Rosaceae undiff.			1	1		2
Caryophyllaceae undiff.				1		1
water plants, mires						
Potamogeton			2			2
Sphagnum				1		1
cereals						
Secale cereale		7	3	2		12
Cerealia T		2	1	1		4
Triticum		1	2			3
Hordeum T		1	1			2
Avena T		1				1
other crops/useful plants						
Humulus/Cannabis	2	32	49	34		117
Prunus T			3	1		4
Apium graveolens			1			1
Rheum			1			1

Tab. III (suite) - Pollens identifiés dans le remplissage des bassins I et II ainsi que dans un échantillon prélevé aux abords du bassin II (comptages), avec également les charbons de bois.

fruit trees						
Sorbus T		1		2		3
Juglans regia	1					1
Castanea sativa		2	1	4		7
ornamental plants						156
Buxus sempervirens				1		1
indiff	28	22	10	47	1	108
Charcoal	129	143	97	185	96	649
sum of pollen and spores	198	709	959	675	19	2 716
spikes added	19 332	19 332	19 332	19 332	19 332	
spikes counted	147	62	43	182	474	908
volume	6	6	6	6	6	
concentration per ml	4 340	36 845	71 858	11 950	129	

Tab. III (suite) - Pollens identifiés dans le remplissage des bassins I et II ainsi que dans un échantillon prélevé aux abords du bassin II (comptages), avec également les charbons de bois.

Neuenstadt am Kocher							
sample	20	21	22	23	24	sum	
feature	1457	1308	1308	1841	1891		
area	U20a1	T20b	T20b	T20b	T20b		
					U20a		
excavation diary no.	1252	1856	1845	1847	1949		
plane	4-5		2-3	above 3			
basin		II	II	II	by I		macrofossils
forest	44,9	22,6	17,5	39,0	47,4	34,3	
Pinus sylvestris	20,7	5,5	3,9	11,9	21,1	12,6	
Quercus	3,5	6,1	4,6	13,5	10,5	7,6	X
Alnus glutinosa/incana	11,6	5,2	4,1	6,2	10,5	7,5	
Fagus sylvatica	6,6	3,0	2,3	4,3		3,2	
Carpinus betulus	2,0	1,3	1,3	1,0		1,1	X
Abies alba		0,7	0,4	0,4		0,3	X
Acer		0,7	0,2	0,3	5,3	1,3	
Fraxinus excelsior		0,1	0,6	0,4		0,2	
Picea abies			0,1	0,7		0,2	
Ulmus			0,1	0,1		0,1	
Tilia	0,5					0,1	
shrubland	11,1	50,8	60,9	26,5	10,5	32,0	
Corylus avellana	10,6	43,3	51,5	17,5	10,5	26,7	X
Betula	0,5	2,5	5,7	4,0		2,6	X
Salix		3,7	2,1	2,7		1,7	
Sambucus nigra/racemosa		1,0	0,9	1,9		0,8	X
Juniperus communis			0,2	0,4		0,1	
Populus		0,1	0,3			0,1	
Cornus sanguinea		0,1				0,0	X
Viburnum opulus			0,1			0,0	X
open land	29,8	23,6	20,5	27,6	36,8	27,7	

Tab. IV - Pollens identifiés dans le remplissage des bassins I et II ainsi que dans un échantillon prélevé aux abords du bassin II (pourcentages), avec également la quantification des charbons de bois.

crop weeds						0,0	
Mercurialis annua		0,1	0,1			0,0	
Achillea T	0,5					0,1	
Bupleurum				0,1		0,0	
ruderal						0,0	
Artemisia		2,3	3,1	1,8		1,4	X
Daucus carota	0,5	1,0	0,3	0,4		0,4	
Rumex undiff.	0,5	0,7	0,4	0,4		0,4	X
Chenopodiaceae		0,6	0,2	0,6		0,3	X
Urtica/Parietaria		0,1	0,8			0,2	X
Plantago maior	0,5		0,2	0,1		0,2	x
Torilis japonica			0,2	0,1		0,1	
Chaerophyllum hirsutum T			0,1	0,1		0,1	
Carduus				0,1		0,0	
Cirsium	0,5					0,1	
Echium				0,1		0,0	
Galeopsis T				0,1		0,0	X
Polygonum aviculare					5,3	1,1	X
Solanum dulcamara				0,1		0,0	X
grassland, fallow land						0,0	
Poaceae undiff	5,6	6,3	4,1	4,1	15,8	7,2	X
Plantago lanceolata		0,3	0,7	0,7		0,4	
Heracleum sphondyleum				0,3		0,1	
Centaurea jacea T				0,1		0,0	
Medicago lupulina T				0,1		0,0	
Pimpinella saxifraga T				0,1		0,0	
Plantago media					5,3	1,1	
wetland						0,0	
Cyperaceae undiff	1,5	0,8	0,2	1,0		0,7	X
Filipendula		0,7	0,4	0,9		0,4	
Angelica sylvestris				0,3		0,1	
Caltha T		0,1				0,0	
forest fringes, heathland						0,0	
Polypodiaceae undiff	5,1	1,6	0,8	3,3		2,1	
Calluna vulgaris			0,1	0,3		0,1	
Hypericum perforatum T		0,3		0,1		0,1	X
Agrimonia eupatoria T				0,1		0,0	X
Anemone nemorosa T			0,1			0,0	
Anthriscus sylvestris				0,1		0,0	
Pteridium aquilinum	0,5					0,1	
open land in general						0,0	
Cichoriaceae	12,6	0,3	0,3	2,2	10,5	5,2	X
Apiaceae undiff.		0,4	0,1	0,6		0,2	X
Brassicaeae		0,1	0,4	0,4		0,2	X
Rubiaceae		0,4	0,1	0,4		0,2	
Ranunculus acris T	0,5		0,3	0,1		0,2	X
Varia		0,3	0,1	0,3		0,1	
Mentha T		0,1	0,1	0,1		0,1	X
Potentilla T			0,1	0,1		0,1	X
Ranunculaceae undiff.		0,3				0,1	X
Rosaceae undiff.			0,1	0,1		0,1	X

Tab. IV (suite) - Pollens identifiés dans le remplissage des bassins I et II ainsi que dans un échantillon prélevé aux abords du bassin II (pourcentages), avec également la quantification des charbons de bois.

Caryophyllaceae undiff.				0,1		0,1	X
water plants, mires						0,0	
Potamogeton			0,2			0,0	
Sphagnum				0,1		0,0	
cereals						0,0	
Secale cereale		1,0	0,3	0,3		0,3	
Cerealia T		0,3	0,1	0,1		0,1	
Triticum		0,1	0,2			0,1	
Hordeum T		0,1	0,1			0,0	
Avena T		0,1				0,0	
other crops/useful plants						0,0	
Humulus/Cannabis	1,0	4,5	5,1	5,0		3,1	X
Prunus T			0,3	0,1		0,1	X
Apium graveolens			0,1			0,0	
Rheum			0,1			0,0	
fruit trees						0,0	
Sorbus T		0,1		0,3		0,1	X
Juglans regia	0,5					0,1	
Castanea sativa		0,3	0,1	0,6		0,2	
ornamental plants						0,0	
Buxus sempervirens				0,1		0,0	
indiff	12,4	3,0	1,0	6,5	5,0	5,6	
Charcoal	54,9	57,4	47,8	63,6	47,3	54,2	

Tab. IV (suite) - Pollens identifiés dans le remplissage des bassins I et II ainsi que dans un échantillon prélevé aux abords du bassin II (pourcentages), avec également la quantification des charbons de bois.

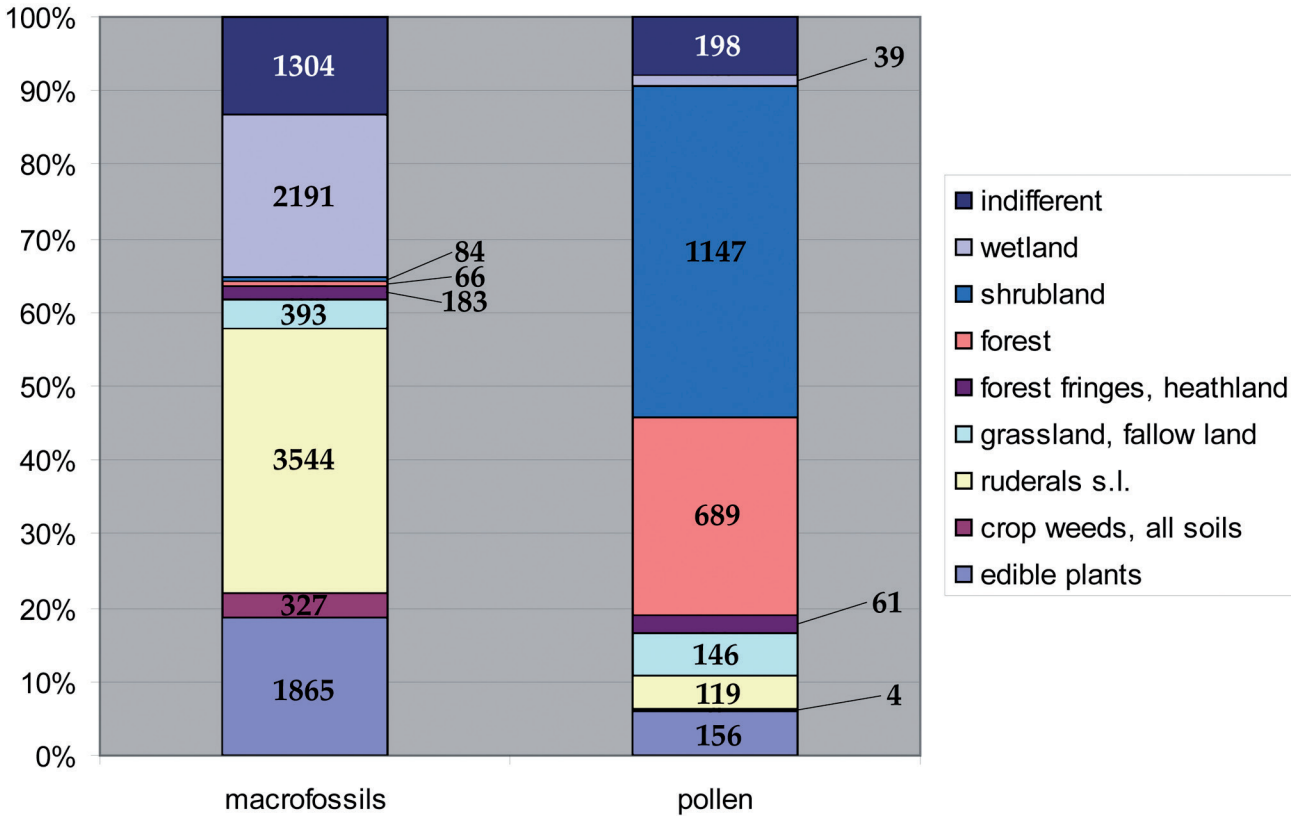

Fig. 7 - Comparaison des pourcentages de représentation des pollens et des macrofossiles.

A comparison of the pollen and macrofossil record

Among the herbs, arable weeds are rather rare, in the pollen as well as in the macrofossil record. More common are ruderals and plants from footpath communities, as well as plants from grassland/fallow land (fig. 7). As expected, forest and shrubland, dominated by wind-pollinated plants are prevailing in the pollen record, whereas groups with locally growing plants, ruderals, wetland and edible plants dominate the macrofossil spectrum. But it is very interesting that several cultivated plants, which are lacking among the macrofossils, are present in the pollen record, as for example cereals, *Apium graveolens* and *Rheum*, as well as *Juglans regia, Castane sativa* and *Buxus sempervirens*.

DISCUSSION AND CONCLUSIONS

South-west Germany was occupied by the Romans until A.D. 260, when they retired and left the region to the invading Alamannic tribes. Although this is an important research topic since longer times, the circumstances and reasons of this change are still unclear. Several archaeological traces of fires, slaughtering and violence are known, but they could have been a normal implication when barbarians occupied a new country. We do not know if there was some kind of war or if the Romans left more or less deliberately.

In any case, it is not very probable that Romans filled the basins with litter, but rather some Alamannic people, after the Romans were already gone. From this fact, we can draw three conclusions:

First, when the Romans used the sanctuary, the basins were clean and filled with clear water, most probably used for ritual bathing. Second, the Alamans that took over this site, didn't worship Apollo Grannus and most likely didn't believe in the healing power of his water basins. Instead they used the basins to deposit litter. Third, the plant remains in the basins do therefore not reflect the diet of the Romans or of the Apollo Grannus worshippers, but of plain Alamannic people.

The material dropped in the basins was mostly rubbish, only weakly reflecting agriculture and nutrition of the Alamans.

In cesspits and other archaeological features with wet preservation, fruits and nuts gathered in the wild are rather common from the Neolithic to Modern Times, and also in the Migration period (Rösch 2008). This must not be discussed further. Gathering of fruits in the wild was more important for the inhabitants of Neuenstadt than cultivation. With the exception of pollen from *Juglans regia*, *Castanea sativa* and *Buxus sempervirens*, all wind-pollinated and perhaps transported from longer distance, cultivated fruits and nuts, as known for other Migration period sites in Southwest Germany, are lacking in Neuenstadt.

Cannabis sativa, native in Central Asia, did not appear in Central and Western Europe as a crop before the Iron Age (Körber-Grohne 1987, Kroll http://www.archaeobotany.de/database.html 04.10.2014, Matterne 2001, Bouby 2002). Its cultivation in Southwest Germany during the Migration period is indicated by seeds from Langenau and Aalen (Rösch 2008).

Humulus lupulus is an indigenuous liana reflected by archaeological finds of fruits and also by proof from pollen profiles since the Neolithic. Its main use today is as an additive for beer. For this purpose, only female plants were cultivated in gardens. This started in the Carolingian period (Behre 1998, 1999). Previously wild gathered material was used. The earliest indication for *Humulus* as a beer additive is in a wooden bottle from an Alamannic grave of the 6th century (Rösch 2014). The fruits from Neuenstadt must be from wild plants. Wether they indicate any use, is not sure. In the pollen record, *Humulus/Cannabis*, which we did not differentiate, is rather abundant.

Carum carvi is also indigenuous and common in rather dry meadows, mainly in higher elevations. Since the Medieval period until today the fruits were used as spice especially in Northern, Eastern and Central Europe. As far as we know, the Romans didn't use this plant, but there is few archaeobotanical evidence for the Latène and Roman periods (Boenke & Stöllner 2003, Jacomet 2002, 2003). In the case of Neuenstadt use is very probable, because potential natural stands of the species could not have been in the direct vicinity of the sanctuary, and because of the rather large amount of items.

There is further proof for a vegetable/spice by a pollen grain of *Apium graveolens*. The cultivation of this plant in Southwest central Europe is known not only for the Migration period, but also for the Iron Age and Late Neolithic (Jacomet 1988, Fischer *et al.* 2010). A little bit surprising is a pollen grain of *Rheum*, because this plant of Central and Eastern Asian origin is thought not to be introduced to Europe before Modern Ages (Hegi 1981).

Piper nigrum is a spice imported since Prehistoric times from Southern and Southeastern Asia, were the shrub is cultivated (Rösch 2003). Cultivation is only possible under tropical climates. It goes back there to Prehistoric times. The oldest archaeological finds in Europe are dated to the Roman period and the Late Iron Age and can be regarded as evidence for long-distance trade (Kucan 1992, Bakels/Jacomet 2002, König 2001, Gray 2002, Rösch 2003, Wiethold 2007). The grain from Neuenstadt is

the first and only one for the Migration period in Southwest Germany. It gives evidence for the use of this spice by Alamans. From where they got it, is a topic of speculation. It is most probable that they robbed or stole it from Romans or that they found it in abandoned Roman buildings.

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Resumé

Le comblement de deux bassins octogonaux d'un sanctuaire gallo-romain consacré à Apollo Grannus, à Neuenstadt am Kocher, dans le Baden-Württemberg, contenait une forte concentration de matières organiques conservées sous l'eau. Les macro-restes de plantes et les pollens y ont été étudiés. La seule évidence de plantes cultivées par l'agriculture y est fournie par des pollens de céréales et des macro-restes et pollens de *Cannabis sativa*. D'autres plantes cultivées sont *Apium graveolens* et *Rheum rhabararum*, attestées par les pollens, ainsi que les macro-restes de *Piper nigrum*, plus surprenant. On trouve des plantes comestibles collectées dans la nature telles que *Humulus lupulus*, et différents fruits. D'un point de vue général, on a affaire à un paysage plus ou moins semi-ouvert, avec forêts, zones de buissons et terrains agricoles. Selon une monnaie et les datations ^{14}C les bassins ne furent pas comblés à l'époque romaine, pendant l'utilisation du sanctuaire, mais par la suite,

lorsque les Romains se retirèrent jusqu'au Rhin supérieur et que la région était occupée par des Alamans. Le comblement fut donc vraisemblablement causé par ces populations et il est surprenant qu'ils possédaient, de toute évidence, du *Piper nigrum.*

Mots clefs : sanctuaire gallo-romain, *Apollo Granus*, macro-restes et pollens, palynologie.

Abstract

The filling of two octagonal basins of a Roman Apollo Grannus sanctuary at Neuenstadt am Kocher, Baden-Württemberg contained wet preserved organic matter in high concentration. Plant macrofossils and pollen were studied. The only evidences for cultivated agricultural plants were cereal pollen and fruits as well as pollen of Cannabis sativa. Other cultivated plants are Apium graveolens and Rheum rhabarbarum, documented by pollen, as well as a fruit of Piper nigrum, the latter a rather surprising find. Common were edible plants gathered in the wild, as Humulus lupulus and several fruits. In general, a more or less semi-open landscape with forest, shrubland, and agricultural land is indicated. According to a coin and radiocarbon dates the basins were not filled-up in the Roman period, when the sanctuary was in use, but afterwards, when the Roman border was shifted back to the Upper Rhein and this region was occupied by Alamannic tribes. The filling of the basin was therefore most probably caused by those people, and it is rather surprising that they obviously had Piper nigrum.

Keywords : Environment, sanctuary, wood, forest, spruce, box, lime tree.

Zusammenfassung

Im feuchten Einfüllschutt von zwei sechseckigen Wasserbecken des dem Gott Apollo Grannus geweihten gallo-römischen Heiligtums in Neuenstadt am Kocher in Baden-Württemberg hatte sich eine starke Konzentration von organischem Material erhalten. Die Makroreste von Pflanzen und die Pollen wurden Analysen unterzogen. Von Nutzpflanzen zeugen nur Getreidepollen und Makroreste und Samen von Hanf (*Cannabis sativa*). Weiterhin wurden Sellerie (*Apium graveolens*) und Rhabarber (*Rheum rhabararum*) angebaut sind das dann nicht auch Nutzpflanzen, von denen sowohl Mikro- als auch Makroreste zeugen. Makroreste von schwarzem Pfeffer (*Piper nigrum*) sind dagegen eher eine Überraschung. Es wurden auch Reste von in der Natur gesammelten essbaren Pflanzen gefunden, wie Hopfen (*Humulus lupulus*) und verschiedene Früchte. Insgesamt war die Landschaft mit Wald, Strauchzonen und landwirtschaftlich genutzten Flächen mehr oder weniger halboffen. Einer Münze und den ^{14}C-Datierungen der Wasserbecken zufolge wurden die Becken nicht in römischer Zeit, als das Heiligtum noch genutzt wurde, zugefüllt sondern erst später, nachdem die Römer sich an den Oberrhein zurückgezogen hatten, und die Region von den Alamannen besetzt war. Die Becken sind also wahrscheinlich von ihnen zugeschüttet worden und es überrascht, dass sie unzweifelhaft schwarzen Pfeffer besessen haben.

Schlagwörter : Gallo-römisches Heiligtum, Apollo Grannus, Makroreste und Pollen, Palynologie.

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