Roman Aqueduct Carbonates:
Palaeoenvironmental Reconstructions and Water Management

Workshop, 16–17 February 2023
Maison Française d’Oxford

convened by Gül Sürmelihindi, Julien Curie, Andrew Wilson and Olivier Delouis

Ancient aqueducts and related structures can in a sense be brought back to life through study of the carbonate incrustations that formed during their periods of use. These laminated deposits precipitated over decades or centuries, and reflect periodic changes in temperature, discharge, and water composition. From them we can reconstruct usage chronologies, and breaks in the sequence of deposition may record events such as channel cleaning, or earthquake damage. Aqueduct carbonates are thus archives from which we can learn about past environmental conditions and water-management activities including responses to drought and earthquake. Carbonate deposits are therefore of interest to a wider community to understand resilience and persistence in ancient societies.
The goal of this workshop is to bring together different studies, disciplines, ideas, and perspectives to assess the state of the field in research on carbonates in ancient hydraulic structures; to explore the limits of the possible in this area, and develop a research agenda for the future. It aims also to increase wider awareness of aqueduct carbonate studies and their applicability to historical questions of ancient water management and human response to environmental change.

February 16th 2023

09:45 Welcome & Introduction
Olivier Delouis, CNRS – Maison française d’Oxford, Campion Hall
Andrew Wilson, Institute of Archaeology / All Souls College, Oxford

10:00 Keynote 1: *Carbonates and other proxies: refining the narrative of the water supply of Constantinople*
Jim Crow, University of Edinburgh

<11:00 coffee and tea >

11:30 Paper 1 : *From HYDROSYRA to WaterTraces. Why combine archaeology and environmental sciences?*
Sophie Bouffier, Aix Marseille Université – Centre Camille Jullian

12:15 Paper 2: *Sinter deposits in the Eifel aqueduct, Cologne*
Klaus Grewe, Rheinisch-Westfälische Technische Hochschule Aachen

<13:00 lunch at MFO (speakers)>

14:00 Paper 3: *Urban water quality through time in Paris, France: what can be learned from CaCO3 deposits found in historical aqueducts*
Edwige Pons-Branchu, Université de Versailles Saint-Quentin (UVSQ) – Laboratoire des sciences du climat et de l'environnement
(UMR CEA/CNRS/UVSQ)

14:45 Paper 4 : *High resolution paleoenvironmental record from carbonate deposits in the roman aqueduct of Traconnade, Aix-en-Provence, France*
Christelle Claude, Aix-Marseille Université – Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement

<15:30 coffee and tea >

16:00 Paper 5: *Geological evidence of exhausted hydrothermal venting in Veii Campetti Southwest archaeological site (Rome, Italy)*
Tiziano Latini, Sapienza Università di Roma – Ministry of Culture, Italy

16:45 Paper 6 : *A geoarchaeological approach to carbonate deposits from Roman sanctuary and thermal baths in Jebel Oust (Tunisia)*
Julien Curie, CNRS – ArScan (Nanterre) & ArTeHis (Dijon)

17:30 Discussion

<18:00 wine & cheese at MFO (speakers and public)>

<19:30 dinner at All Souls (speakers)>

February 17th 2023

10:00 Keynote 2: *Through a glass, darkly: the use of aqueduct carbonate to understand the Roman world*
Cees Passchier, Johannes Gutenberg University Mainz, Germany
Gül Sürmelihindi, Marie Skłodowska-Curie AQUEA – School of Archaeology, Oxford

<11:00 coffee and tea >

11:30 Paper 7: *Reconstructing chronologies of usage, maintenance, and abandonment in Roman aqueducts from carbonate deposits: the aqueduct of Divona (Cahors)*
Gül Sürmelihindi, Marie Skłodowska-Curie AQUEA – School of Archaeology, Oxford

12:15 Paper 8: *Organic Compounds in carbonates from the Anio Novus (Rome)*
Duncan Keenan-Jones, University of Manchester – School of Arts, Languages and Cultures
Edwige Pons-Branchu, Université de Versailles Saint-Quentin (UVSQ) – Laboratoire des sciences du climat et de l'environnement (UMR CEA/CNRS/UVSQ)

<13:00 lunch at Kellogg College (speakers)>

14:30 Paper 9: *Trace element analyses and Pompeii's water supply*
Duncan Keenan-Jones, University of Manchester – School of Arts, Languages and Cultures

15:15 Paper 10 : *The Pompeii water supply system and the Aqua Augusta: a (rather) complex story*
Julie Carlut, CNRS – Institut de Physique du Globe de Paris

<16:00 coffee and tea break>

16:30 Paper 11: *The contribution of carbonate deposits to understanding the functioning of the Roman aqueducts of Arles*
Philippe Leveau, Aix-Marseille Université – Centre Camille Jullian (*in absentia*)

17:15 Summing up and closing discussion
Andrew Wilson, Institute of Archaeology / All Souls College, Oxford

Abstracts

Carbonates and other proxies: refining the narrative of the water supply of Constantinople

Jim Crow

School of History, Classics and Archaeology, University of Edinburgh, Edinburgh, UK

The Roman and Byzantine water supply of Constantinople was not only one of the longest water supply lines from antiquity, but also one of the longest enduring, with parts continuing to function into the twentieth century. Recent research on carbonate samples from different locations at the west end of the system has important results characterising the sources and relating to the annual management of the system. This paper will review some of these results and contrast them with other archaeological and engineering observations concerning energetics and changing architectural renovations all of which contribute to our understanding of this complex system and how it evolved over time.

From HYDROSYRA to WaterTraces. Why combine archaeology and environmental sciences?

Sophie Bouffier

Aix Marseille Univ, CNRS, CCJ, Aix-en-Provence, France

Since 2015, an Aix-Marseille University team has obtained funding to develop interdisciplinary programs about water management in ancient times. The objective was to understand the utilisation of water resources in past societies to explain hydraulic choices made by Mediterranean societies, and their evolution. What was their natural environment? their climate? their geology and water environment? and how did they adapt to it? Historians and archaeologists asked the palaeo-environmentalists to give them paleo-climatological and hydrological data in order to understand the politics of the populations and their health status. The method consisted in bringing together the humanities, social sciences and geosciences, sometimes using common methods and tools, but also specific ones: data archives, prospecting, excavations and samples, physicochemical analyses, enabling comparisons between the different approaches of archaeologists, historians and environmentalists. Field studies and sampling were carried out on several Sicilian and Italian sites to document the abundance or scarcity of available water, its quality, its possible depletion over the centuries. One of them focused on carbonates to contribute to determine the evolution of the water management structures and their technological transformation during their transmission between Mediterranean cultures. The communication will review the different types of analyses that have been done and their issues on historical interpretations. It should be compared with the case studies made by colleagues, especially in France, Italy (Sicily) and Greece.

From Roman aqueduct carbonates to aqueduct marble: A very special building material from the Roman Eifel aqueduct

Klaus Grewe

Rheinisch-Westfälische Technische Hochschule Aachen, Germany

A very particular problem arose where the Romans used calcareous water to supply their cities or military camps. When the water was transported from the springs to the places where it was used, limescale formed inside the channels or pipes. Therefore, the question has always arisen as to why efforts were still made to use this hard water for supply. The answer that the Romans loved this water because of its taste can't be right. So, there must have been another reason. Since there are no ancient sources on this subject, one has to look elsewhere for the explanation, and a new question inevitably arises: Was it perhaps because lead pipes were used for inner-city water distribution, although Vitruvius knew that lead was extremely poisonous? Could the water have possibly avoided contact with the lead due to the lime deposits? The lecture seeks an answer to this question.

However, the lime deposits in the Eifel aqueduct to Cologne are of a very special quality. In no other Roman water channel—although calcareous water was used for many supply lines— was there an aqueduct carbonate that was comparable in quality to the Cologne calcareous sinter. This material was later to develop into a real bestseller: in the absence of other true marbles, people exploited the 'Roman aqueduct quarry' for the decoration of Romanesque churches in the 11th–13th centuries, and quarried this marble substitute *en masse*. In the hands of skilled stonemasons, a decorative stone was created that was used in almost all Romanesque churches in the Rhineland and the Netherlands. It was also used as 'aqueduct marble' in cathedrals in northern Germany, Denmark, and England. Countless columns, altar slabs, and grave slabs made of this material are still preserved in their old beauty.

For a long time, scientists have also tried to use the layers of limestone deposits to date the aqueducts' useful life. For many years it was believed that the sequence of layers would be just as useful as the annual layers of trees for dendrochronology. The answer to this question, however, has turned out to be very difficult.

Urban water quality through time in Paris, France: what can be learned from CaCO3 deposits found in historical aqueducts

Edwige Pons-Branchu,[1] Matthieu Roy Barman, Sophie Ayrault, Louise Bordier, Philippe Branchu, Emmanuel Dumont, J.P. Dumoulin, Eric Douville, Julia Garagnon, Jean-Luc Michelot, Gael Monvoisin, Aurélie Noret, Yves Perrette, Jules Querleux, David Ramier, Nadine Tisnérat-laborde… and many others

[1] LSCE, CNRS, France

Over the last 8 years, we have explored the possibility of using secondary carbonate deposits (SCD) from historical aqueducts in Paris or its suburbs, heavily affected by human activities, as archives of past water quality. The first step was to adapt the dating methods to these very young and detrital carbonates as follows:

— for absolute dating by the U/Th method, technical improvements for the measurement of small signals and the development of age correction methods;

— the verification of the seasonality of laminae in the case of urban deposits;

— the possibility of tracing the nuclear bomb pulse from the 1960s, to constrain the chronology of SCDs.

In the course of two projects funded by the city of Paris and the French national agency for research (ANR, project 18-CE22-0009), we studied well-dated SCDs (up to 300 years old) from springs in the north (north of Paris, Belleville aqueduct), and south of Paris (Medicis aqueduct) in order to assess the impact of urban development on the water quality. For these reconstructions, we use geochemical tracers such as trace elements (including rare earth elements), sulphur content and isotopes, or lead isotopes measured on SCDs.

Among the results obtained during these projects, we have demonstrated that the installation of fills using gypsum quarry discharges during the phase of urbanisation in the middle of the 19th century was at the origin of the significant and sudden increase in sulphur content recorded in the SCDs and thus in the water that allows their deposition.

High resolution paleoenvironmental record from carbonate deposits in the roman aqueduct of Traconnade, Aix-en-Provence, France

C. Claude,[1] L. Vidal, C. Passchier, B. Angeletti, A. Guillou, P. Deschamps, A. Ricolleau, G. Sürmelihindi, C. Sonzogni, D. Delanghe, B. Fino, M. Fuhry, Ph. Leveau, L. Marié, M. Panneau, G. Gassier, and N. Nin.

[1] CEREGE, Aix-en-Provence

Many Roman aqueducts have laminated carbonate concretions forming on the bottom and walls of the aqueducts. A recent study suggests that laminated carbonate concretions from aqueducts provide information about groundwater quantity and composition, temperature, and rainfall. We present here an interdisciplinary approach to study the carbonate concretions of the Roman aqueduct of Traconnade (urban part) (Aix-en-Provence, France) combining mineralogy, geochemistry and archaeology with the objectives of reconstructing the hydro-climatic conditions, and water resource in the Roman period. The aqueduct of Traconnade is one the most important and remarkable of Aix-en-Provence, and is dated to the 1st or 2nd century AD. Absolute U-Th dating was carried out by the isochron method. The calculated age is 2400 ±100 years, which confirms that the carbonate sample was deposited in Roman times.

Observations of polished sections revealed lamination in doublets (156±10), ranging in thickness from 0.2 to 4.6 mm. X-ray diffraction analysis of powder from the carbonate concretions showed the presence of a few percent quartz in the calcite and alumina silicates. The presence of this silico-clastic phase seems to be confirmed by the in-situ analysis by LA-ICPMS, which shows significant amount of Si, Al, K, Fe and Th, strongly correlated with each other but not with Ca. In parallel, the Ca/Mg, Sr/Ca and U/Ca ratios vary with the Si, Al, K, Fe and Th contents and $d^{13}C$ while $d^{18}O$ varies inversely. Comparison with the seasonal isotopic variability of the source and precipitation suggests that the chemical and isotope variations observed reflect seasonal changes (summer-winter), summer being characterized by a lower $d^{18}O$ but higher elemental/Ca ratios. Taken together, these results are encouraging for the reconstruction of regional hydrological conditions for the Roman period.

Geological evidence of exhausted hydrothermal venting in Veii Campetti Southwest archaeological site (Rome, Italy)

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Hydrological, mineralogical, and petrochemical analysis of water and rock samples in Veii Campetti Southwest verified the possible presence of paleo-hydrothermal springs on the archaeological site. Veii is a settlement established in Protohistoric times on a volcanic plateau of the Sabatini district near Rome. During archaeological excavations, water-related buildings were identified in Campetti Southwest. The discovery of ancient votive inscriptions in this settlement also suggests a sacred dimension to some water-related activities. Nowadays, there are no springs active on the site, yet a Roman tank has yielded some travertine formations and Fe hydroxides, probably related to chemical precipitation from a thermo-mineral spring which is no longer active. The rapid kinetics of the precipitation reaction preclude the possibility that the thermal water was collected outside the site. Based on the hydrogeological framework, data collected on the local travertine formation, nearby active thermo-mineral springs, and related travertine deposits in the Veii area enabled the definition of the regional evolution of the short-term groundwater dynamics and understanding of the development of the site.

A geoarchaeological approach to carbonate deposits from Roman sanctuary and thermal baths in Jebel Oust (Tunisia)

Julien Curie,[1] C. Petit,[2] John Scheid,[3] A. Ben Abed,[4] and Henri Broise[5]

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[3] Collège de France, Paris
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[5] IRAA CNRS, Aix-en-Provence

Located about 42 km southwest of ancient Carthage (in northern Tunisia), the hot spring of Jebel Oust is an exemplary model of the interactions between travertine — i.e. deposits from hydrothermal waters — and human activities. The exploitation of this hot spring since Roman times has led to the transition from a natural gentle slope deposit model to one with anthropogenic effects on how carbonates were deposited. This results in a greater diversity of morphologies and facies of the travertine. The ancient sanctuary built just above the vent of the hot spring is dominated by iron-rich hydrothermal deposits. A deep underground aqueduct, providing hot waters from the spring to well-preserved Roman baths located downstream, is mostly filled with puff-pastry travertine and some terrigenous sediments. Finally, the travertine preserved in the Roman baths shows several morphologies and facies because of the diversity of man-made structures. Hot pools are filled with alternate dark/bright laminated travertine, whereas the tepid ones are characterized by alternate dense/porous laminate deposits — marked by a biological influence — and pools used as tanks (colder waters) are filled with spongy travertine with higher isotopic values of $\delta^{13}C$ and $\delta^{18}O$. Facies of water canalizations and pipes, with a characteristic morphology, and some crystalline crusts travertine forming small cascades, which are correlated with the decay of the site during Late Antiquity, complete the array of deposits. These anthropogenic travertines reflect strong human forcing on the environment and the palaeohydrological dynamics of the hot spring. Moreover, their sedimentological and geochemical features are rich sedimentary records of past human engineering and water management.

Through a glass, darkly: the use of aqueduct carbonate to understand the Roman world

Cees Passchier[1] and Gül Sürmelihindi[2]

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[2] School of Archaeology, Oxford, UK

Many ancient water systems, of which Roman examples are the most spectacular, contain evidence of use in the form of calcium carbonate deposits in channels, pipes and basins. These deposits form in flowing hard water, and contain information on changing water temperature, composition, and discharge with a very high-resolution of daily or even hourly lamination. However, these archives are not only influenced by weather-related physical and chemical changes but contain several signatures derived from (1) the shape and positioning of the water transporting structures used; (2) their maintenance; (3) the nature of the water sources, and indirectly, of feeding aquifers and (4) earthquakes. landslides, settling and similar external effects. All these signatures provide equally interesting and rewarding sources of data in archaeology, hydrology and palaeo-seismology as the palaeo-environmental applications. Several examples are presented such as the watermills of Barbegal, where carbonate formed on now decayed wood of the machinery giving information on the slope, shape, and history of mill flumes and wheels; indications for aquifer size preserved in Jerash and Béziers; and traces of earthquakes as preserved in the water systems of Ephesos, Patara, and Jerash.

Several geochemical and geological methods have been applied to study aqueduct carbonate deposits. Basic field observations on the shape and height of the deposits gives information on water level variations in an aqueduct, on local cleaning or modification, and on earthquakes and other external effects on the structure. Details on flow velocity changes and maintenance can be obtained from samples through the study of the distribution of crystal structure, stable isotopes and trace elements. Of these methods, stable isotope analysis is our major tool, since the distribution of isotopes of oxygen and carbon carry information about environmental change, gradual or sudden events, and about the nature of the sources and aquifers feeding the water system.

Ideally, aqueduct carbonate should be datable with an absolute annual resolution, but this is presently not possible. The best we can obtain are floating time series, which are better suited for topical rather than climatological research. Nevertheless, the versatility of aqueduct carbonate can make an important contribution to science even without precise dating.

Reconstructing chronologies of usage, maintenance, and abandonment in Roman aqueducts from carbonate deposits: the aqueduct of Divona (Cahors)

Gül Sürmelihindi,[1] Cees Passchier,[2] Andrew Wilson,[3] and Didier Rigal[4]

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[3] School of Archaeology / Faculty of Classics, and All Souls College, Oxford, UK
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This paper asks how we can extract information about environmental and structural changes from the carbonate records in aqueducts, and differentiate between them. Can we see corresponding measures and adaptations by aqueduct maintenance personnel in response to environmental changes, in order to sustain water supply? It uses a rare example of aqueduct carbonate in which the organisational skills and level of resilience of a Roman urban community are recorded, and challenges many of our assumptions drawn from other aqueduct carbonate sites.

Analysis of samples of aqueduct carbonate from the Roman aqueduct of Divona (Cahors, France) shows attempts to adapt to changing environmental and structural conditions which, by regular cleaning, repairs, modifications, and even the timing of maintenance, have left their traces in calcium carbonate deposits. A geological study of the $\delta^{18}O$ profile of the carbonate stratigraphy shows a clear cyclicity that we infer reflects seasonal water temperature variations in the channel, enabling the reconstruction of an annual pattern that can be used to determine the usage chronology of the aqueduct and the timing of maintenance events. The last maintenance event occurred only a few years before the final abandonment of the water supply, showing that the end of aqueduct usage was unexpected but at the same time inevitable: the increasing porosity of carbonate shortly after the last cleaning episode suggests a deterioration of the structure and lack of organisation, or reduced water quality and discharge.

The Divona aqueduct is the central example discussed, where constant adaptations and modifications are recognised. It provides some inspiration to revisit some aqueduct and water mill sites to see whether modelling of Roman maintenance is possible from their carbonate archives. Finally, when, why, and how aqueducts were abandoned is a subject of particular interest.

Organic Compounds in carbonates from the Anio Novus (Rome)

Duncan Keenan-Jones,[1] Yves Perette,[2] Robert Catalano,[3] Patrick Roberts,[4] Rory McLennan,[5] and Edwige Pons-Branchu[6]

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[2] EDYTEM, CNRS, France
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Archaeological travertine deposits show great promise as a record of the environmental and climate conditions under which they formed. Previous work has hypothesized that dark layering from river-fed aqueduct travertine probably reflects upstream rainfall patterns and/or *in situ* microbial mats.

Dark-coloured layers are present in these travertine deposits on multiple scales down to the micron-scale. In travertine from ancient Rome's Anio Novus aqueduct, the layering can be matched with high precision in multiple samples from different locations along 350 m of the flow path 9 km upstream of the city. The dark layers' multi-scalar distribution and elevated organic concentrations are consistent with formation during the organic-rich flows of the Anio Novus' source water during storm events, well-characterized by ancient and modern evidence. In similar travertine deposits from hot springs layering often results from microbial communities.

Here, we present a new 55-cm-long core procured from the complete travertine deposit of the Anio Novus in November 2019. The oldest layers, at the base of the core, match those of the three existing travertine samples. This new core, however, continues to follow the history of the aqueduct until its breakdown, probably in the 5th century AD. Major macro-scale unconformities (discontinuities in the layering) show where travertine was removed during the aqueduct's maintenance, dividing the history of water flow preserved in this travertine into 7 periods. These travertines have been analysed through fluid dynamic, petrographic, fluorescent and cathodoluminescent techniques, as well as lipid biomarker extraction.

We are now using this new core to test the hypothesis that aqueduct travertine dark layering is a high-resolution record of rainfall patterns. Advanced fluorescence imaging and lipid biomarker analysis estimate the relative contribution of rainfall runoff and microbial communities by differentiating between different carbon compounds introduced by each, which has been very effective in similar deposits such as stalagmites. If the hypothesis is correct, dark layering in archaeological travertines from river-fed aqueducts would be a proxy of rainfall distribution at a sub-annual (perhaps even daily) resolution, due to the practically instantaneous response of the upper Aniene river to rainfall events. If there are sufficient biomarker concentrations, the validity of dark layering will be checked by analysing the hydrogen and carbon isotopic composition of plant waxes, which have been used to estimate the intensity and length of past wet seasons.

Trace element analyses and Pompeii's water supply

Duncan Keenan-Jones,[1] George Vazanellis,[2] Adrian Bowman,[2] John Hellstrom,[3] Russell Drysdale,[3] Ellie Hughes,[4] and Glenys McGowan[4]

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[2] University of Glasgow
[3] University of Melbourne, Australia
[4] University of Queensland, Australia

This research concerns carbonate deposits from aqueducts around the Bay of Naples, principally the Aqua Augusta aqueduct, and from the town of Pompeii.
Our research seeks to determine

1. the source of the water that supplied Pompeii, and in so doing evaluate the previous studies of Ohlig (2001) and Matsui and co-workers (2009);
2. whether contamination by any elements, such as tin, antimony or copper, other the known contamination from lead, arose from Pompeii's lead pipe distribution system; and
3. whether trace element concentrations show promise as a technique to provenance the source of the water in past water systems.

We have integrated analysis of limestone deposits (travertine or sinter) formed from the water supplied to these ports with relevant historical and archaeological data and investigated the micro-stratigraphy and trace element composition of the travertine through laser ablation inductively-coupled plasma mass spectrometry (LA-ICP-MS). Due in part to the ineffectiveness of inclusion screening procedures, the trace element concentration is heavily dependent on localized heavy metal contamination and deposition of detrital material, rather than source water composition. Trace elements are concentrated in particular inclusion-rich layers, which provide important dating information, but whose presence or absence affects overall concentrations. Hence, the trace element composition of ancient travertine deposits around the Bay of Naples is not suitable for source water provenancing, calling into serious question the results of previous studies.

The Pompei water supply system and the Aqua Augusta: a (rather) complex story

Julie Carlut,[1] Hélène Dessales,[2] and Francesca Filocamo[3]

[1] CNRS, IPGP
[2] ENS, UMR CNRS AOROC, Paris
[3] CJB - Centre Jean Bérard CNRS

The Serino aqueduct (also called the "Aqua Augusta") was constructed during the reign of the emperor Augustus. It provided water through the Campanian region up to the city of Misenum where a Roman fleet was based. One of the branches is thought to have

supplied the city of Pompeii for an unknown duration, prior to the destruction of the city in AD 79. However, this branch has not been found and doubts remain regarding the actual connection. The feasibility of a water supply system from the Serino aqueduct towards and within Pompeii is also a matter of disagreement. The Serino aqueduct water emerges from limestone and dolomite from the Terminio karst aquifer and runs from Serino to Misenum allowing the precipitation of carbonate deposits along its route. While such precipitations were unwelcome during operation, causing narrowing of the conduits and additional load on the structure, these deposits are now recognized as a source of very valuable information about the operation of the aqueduct and the local environment.

Deposits from Augustan portions of the aqueduct between Sarno and Palma Campania were analysed in a previous study. Puzzling results were found, in particular: indications for a low level of water, despite the vast regions supplied; a reconstruction of part of the structure; discontinuities between portions of the aqueduct. Interestingly these disruptions are located near where the Pompeii branch is suspected to connect. In this talk we will present results from new deposits recovered in Pompeii which shed lights on the connection with the main branch of the Serino aqueduct. Our results attest a junction hampered by a complex line of events and difficulties in achieving a good water flow through the city.

The contribution of carbonate deposits to understanding the functioning of the Roman aqueducts of Arles

Philippe Leveau

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Necessarily multidisciplinary, the study of an aqueduct involves a great variety of people besides archaeologists and historians: architects, engineers, and hydraulic specialists. We owe to them the re-reading of the four first chapters of book VIII of Vitruvius' *De Architectura*. These disciplines allow us to understand and describe the functioning of aqueducts during the early years of their operation. An addition during the last thirty years is the study of geochemistry, offering the possibility of grasping the process of ageing of aqueduct structures which Frontinus had described in his treatise on the aqueducts of the city of Rome, as well as gaining a better understanding of the legislation relating to aqueducts in the corpora of juridical texts.

In Provence, this interdisciplinary approach has resulted in publications which have dealt principally with the aqueducts of Nîmes, Arles, and Fréjus. The aim of this paper is two-fold :

(1) to present the advances which it has allowed on the knowledge of the aqueduct which supplied the Roman colony of Arles ;
(2) to define the aims of a re-study of the concretions in the basin at the junction of the convergence of the two branches of the aqueduct of Arles.