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Orient Cunéiforme: the Benefits of New Technologies for the Propagation of Knowledge and Scientific Research

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Nowadays, the Internet, 3D scanning and interactive media have become useful tools for scientific research as well as for education. The website *Orient Cunéiforme* aims to use all these modern media to highlight important pieces of the Mesopotamian written heritage.

Orient Cunéiforme, <http://archeologie.culture.fr/orient-cuneiforme/fr>, is a section of the website *Patrimoine du Proche Orient* <http://archeologie.culture.fr/proche-orient/fr>, led and funded by the *Ministère de la Culture – Direction Générale des Patrimoines* of France. The project of this website was initiated in March, 2015. It stems from the will to react to the ransacking of museums and archaeological sites in Iraq and Syria. Its objective is to disseminate knowledge on threatened and attacked sites in the Near East to the general public and scientists, in order to preserve the memory of this heritage. The website *Patrimoine du Proche Orient* is led by the *Directeur général des patrimoines*, edited by the *Musée d'Archéologie Nationale – Domaine national de Saint-Germain-en-Laye* and managed by Thomas Sagory (*Musée d'Archéologie nationale*).¹

The section *Orient Cunéiforme* is specifically dedicated to the written heritage of Mesopotamia. It is the result of a collaboration between a scientific team, ArScAn (Archeology and Sciences of Antiquity) and two museums, the Louvre and the Cabinet des Médailles – Bibliothèque Nationale de France.² We were the creators of the content.

¹ The collection “Grands sites archéologiques” is a publication of the *Ministère de la Culture, Direction générale des Patrimoines, France*. Director of Publication: *directeur général des patrimoines*; publication manager: *sous-directeur de l'archéologie et directeur du Musée d'Archéologie Nationale – Domaine national de Saint-Germain-en-Laye*; editorial coordination: *musée d'Archéologie Nationale – Domaine national de Saint-Germain-en-Laye*; project manager: Thomas Sagory; general secretariat: *sous-direction des systèmes d'information*; direction générale des patrimoines – *département des systèmes d'information patrimoniaux*; website design and production: <https://www.danka.fr>.

² The project partners were: at the laboratory ArScAn (Archéologie et Sciences de l'Antiquité, UMR 7041), Pr. Francis Joannès, Mustapha Djabellaoui and Louise Quillien; at the Cabinet des Médailles: Frédérique Duyrat (Director of the Department Monnaies, médailles et antiques – Bibliothèque Nationale de France) and Mathilde Avisseau-Broustet (Head Curator at the Department Monnaies, médailles et antiques); and at the Louvre Marielle Pic (Director of the Department Antiquités Orientales, Musée du Louvre) and Ariane Thomas (Curator at the Department Antiquités Orientales, Musée du Louvre). The project had benefited greatly from the support of Bruno Favel, chef du Département des affaires européennes et internationales, Direction générale des patrimoines, Ministère de la culture et de la communication.

This portal aims to present selected pieces of the cuneiform heritage in an attractive way. The commentaries on the objects have to be comprehensible for the general public and at the same time reflect the latest advances in scientific research related to the topic. The website is now in French but translations in English and Arabic will be provided.

The first four objects selected and presented on the website are the following:

- The *kudurru* “caillou Michaux”, discovered in 1784 by André Michaux. It is the first monument containing cuneiform writing to have been introduced in Europe and it is currently kept in the Cabinet des Médailles, Bibliothèque Nationale de France.
- The tablet of the 8th campaign of the Assyrian king Sargon the second (AO 5372). This large clay tablet contains an exhaustive account of this Assyrian military campaign and is kept in the Louvre.
- The statuette of Pazuzu (MNB 467), also from the Louvre collection. This object was chosen because it represents a demon who has a certain notoriety in the current popular culture after the release of the horror movie “The Exorcist” in 1973 where he appeared as an evil character.
- The Esagil tablet, kept in the Louvre (AO 6555). This famous mathematical text gives the ideal dimensions of the Etemenanki ziggurat, the symbol of the city of Babylon.

Through this paper, we hope to share our experience of the construction of the website Orient Cuneiform and to show the benefits of new technologies for the propagation of knowledge and scientific research.

1. Objectives and content of the website

1.1. The objectives

The website primarily intends to host inscribed objects of a high historical interest from Northern and Southern Iraq that are recognizable to the general public. The project has four main objectives.

1. First, to create a virtual museum, open to everybody, in order to make pieces of Mesopotamian history kept in French Museums accessible anywhere in the world, especially in the countries they come from. That is why special attention has been paid to the quality of the pictures of the objects: they are either 3D reconstructions or photographs with a very high resolution.
2. Second, *Orient Cunéiforme*, as a part of the website *Patrimoine du Proche-Orient*, supports its determination to show the outstanding value of Near-Eastern heritage in a time when war poses a continuous threat to it. It aims to show that the Near East stores parts of our shared past which the general public is rarely aware of.
3. In the continuity of the above-mentioned idea, this website will provide materials for schoolteachers to teach Ancient Near Eastern History. The history of the ancient Near East is a part of the French school curriculum and is taught in 1st year of junior high school.
4. Finally, the website also intends to make advanced research available to and understandable for the general public.

1.2. The virtual objects

Our ambition is to get the users immediately immersed in the object and the cuneiform writing, in order to arouse their curiosity at the first click. Therefore, the website's home page makes use of the interactive media and presents 3D scans or high definition pictures of the objects. Each media is interactive and signals points of interest on which the reader can click to have either the details of the iconography or the translation of the cuneiform text.

The *caillou Michaux* has been scanned in 3D (fig. 1). The scanning was allowed and supported by the director of the Museum, Frédérique Duyrat, and was made by Yohann Janin (auto-entrepreneur in virtual archaeology), with the photogrammetry technique. One of the difficulties was due to the Caillou itself. The uniformity and dark colour of the panels made it difficult to achieve the best possible results. During the image capture process, it was crucial to maintain good illumination of the object. The broken parts of the stele also posed difficulties, because their texture was different from the smooth parts of the stone. The final result is hosted on the site *sketchfab* and can also be seen on *Orient Cunéiforme*.



Fig. 1: Picture of the 3D scan of the Caillou Michaux.

For the three other objects, kept in the Louvre, high definition pictures are available. As it is the case with the 3D scans, they are interactive. It is possible to zoom on the cuneiform writing and to click on the points of interest. They give access to the translation of the cuneiform text and quick explanations of the content, which might help to generate interest and comprehension among the general public.



Fig. 2: High definition picture of the Esagil tablet.

1.3. The architecture of the website

After seeing the object, itself, the user is offered more detailed explanations. Each object is presented in five pages, according to the same model. The first page is the “cartel” and gives the technical data of the objects: museum number, place of conservation and links to the institutional websites of the museums, date and the place of origin of the object, dimensions, writing and language. Below these data, a short introduction to the object is provided, summing up its main characteristics and historical interest, in order to show at the outset, the reasons why this object is crucial for scientific research and our knowledge of Mesopotamian civilization.

The second page tells the reader what the inscription on the object is about. The purpose is to go into more detail in the content of the text, and explain its nature. The last three pages are dedicated to the development of themes related both to the content of the tablet and to major aspects of Mesopotamian history and culture. For instance, the presentation of the tablet of the 8th campaign of Sargon II highlights the originality and special interest of this tablet through three topics: the geography, the figure of Sargon II, king of Assyria (722-705), and the relation between Urartu and Assyria.

Thus, the tablet of the 8th campaign of Sargon II is an opportunity to present the Assyrian royalty, the tablet of Esagil – mathematics and religion, and Pazuzu – the beliefs of the Mesopotamian people and the practice of exorcism. The presentation of the Caillou Michaux explains the context of the discovery of the first large object, inscribed in cuneiform, to have arrived in Europe and shows its role in the very beginning of the decipherment of cuneiform writing.

This site is intended for both scientists and readers unfamiliar with Assyriology. That is why the difficult terms or Akkadian words are linked to a definition in a glossary. Bibliography and credits are provided at the bottom of each page.

1.4. Interactive media

On top of the written explanations, each page is illustrated by interactive media, through which the reader can explore some specific themes related to the object presented in more detail (fig. 3). These media take the form of pictures, chronologies and maps.

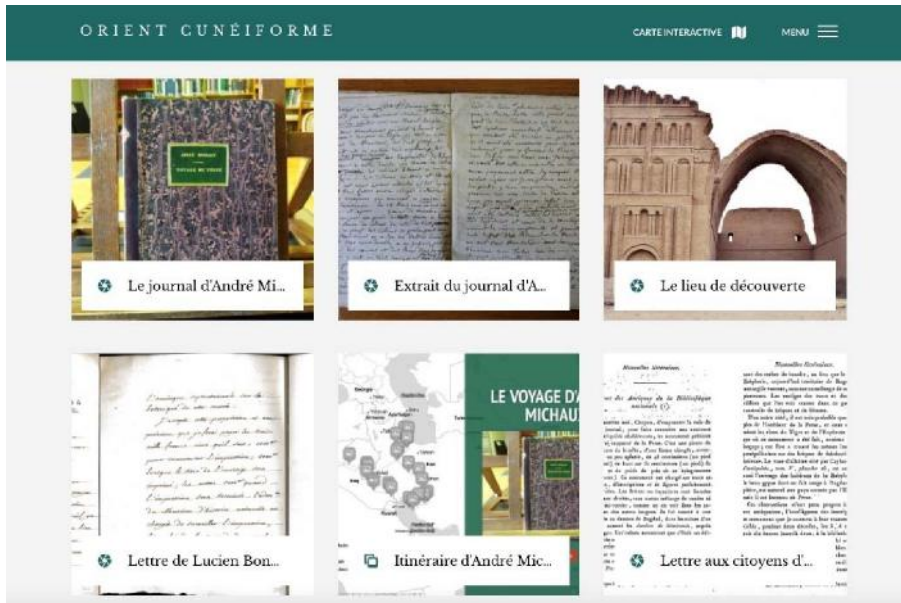


Fig 3: Examples of media.

For instance, the statuette of Pazuzu kept in the Louvre is presented alongside pictures of similar objects kept in the British Museum. These pictures illustrate the popularity of these apotropaic amulets of Pazuzu in Mesopotamia and the diversity of the forms they took: a statuette, plates, beads, pins used to fasten a garment. The photographs of these objects can be presented on the site thanks to the arrangements with the museums that preserve them. Each picture contains a description with its reference and characteristics, accompanied by a link to the web-site of the Museum where it is kept.

Interactive maps and chronologies are other types of media useful for the transmission of knowledge. We used the free software "StorymapJS" and "TimelineJS" to build them. For instance, we've built an interactive map illustrating the travels taken by the discoverer of the *kudurru* caillou Michaux (fig. 4). It gives all the stages of André Michaux's exceptional journey to the Orient between 1782 and 1785, and shows what an extraordinary adventure it was for that time. The data on his travels come from his diaries kept in the Library of Versailles, and they were compiled by Régis Pluchet, descendant of André Michaux.³

³ Pluchet 2014.

André Michaux was a botanist working at the gardens of Versailles under the reign of Louis XVI. In 1782 he left France for the Levant, where his mission was to gather new plants for the gardens of Marie-Antoinette in the Trianon. He discovered a lot of new species during his long travels across Syria, Iraq, and Iran, such as flowers *Michauxia campanuloides* and *Dionysia Michauxii*. On his way back, near Ctesiphon, he came across a *kudurru*, perfectly preserved, datable to Marduk-nādin-aḫḫē, (1099-1082), recording a gift of land from a father to his daughter on the occasion of her marriage. The object was officially acquired by the French government in 1800, after the Revolution, by Lucien Bonaparte, Napoleon's brother, and minister of the interior at that time.

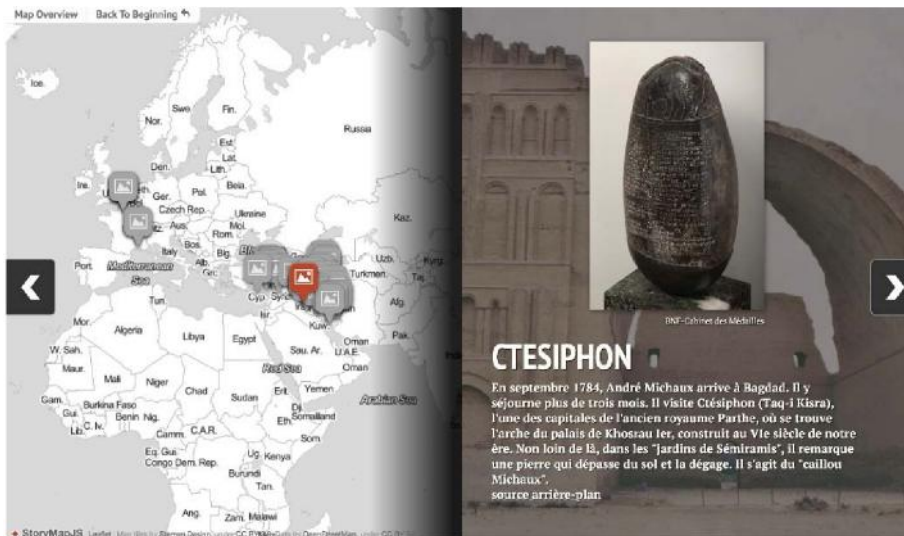


Fig. 4: The map of André Michaux's journey.

The discovery of the Caillou Michaux is important for the deciphering of cuneiform. For this reason, a chronology of the stages of scientific advances in this domain is proposed in the website. It is accompanied by an interactive chronology of all the main *kudurrus* discovered in Mesopotamia, which places the Caillou Michaux in its historical context and provides comparison with other stelae of the same nature.

Thus, 3D scanning, high definition pictures, interactive maps and chronologies allow the website *Orient Cunéiforme* to accomplish its purpose and make the cuneiform heritage and its history available in an interactive way.

2. The benefits of new technologies for education and research

2.1. For Education

This website can supplement teaching Mesopotamian history in high school. The advent of agriculture and the first cities and the invention of writing are a part of the national curriculum in history and have to be taught to every 11-years-old child at junior high school in France. We have already tried out the presentation of the selected objects featured on the website in class. The website can be a vector to introduce cuneiform writing and mathematics to the pupils, as well as

Mesopotamian religion (e.g. presenting the Pazuzu demon (fig. 5) and the Esagil tablet), geography, kingship and war (e.g. the 8th campaign of Sargon), and daily life (e.g. the caillou Michaux, telling about the wedding arrangement).



Fig. 5: Interactive picture of the statuette of Pazuzu.

Moreover, the translated passage of the Esagil tablet, where the measurements of the levels of the ziggurat are given, is an interesting means to teach current school children to decipher the writing of numbers in cuneiform. It can also allow them to practice mathematics by calculating the dimensions of the base and the height of the ziggurat, or convert units of measure. Recent interpretations of the Esagil tablet suggest that the nature of this text was to be a scribe's exercise.⁴ This case study is therefore an ideal opportunity for the students of our time to take on the role of a Mesopotamian scribe learning maths. The aim of this website is to give tools and materials to the teachers willing to introduce Mesopotamian history to their pupils, with the role support of its content.

Orient Cunéiforme and, more generally, the site it belongs to, *Patrimoine du Proche Orient*, can also be a good way of introducing the notion of heritage and issues related to its safeguarding to the general public. Indeed, one of the objectives of this portal is to show that an important part of the shared past of the humanity lies in the Near East. Writing, mathematics, measurement of time and myths such as the Tower of Babel are all examples of the legacy of the Mesopotamian civilization to the modern world, and all of them are developed on *Orient Cunéiforme*.

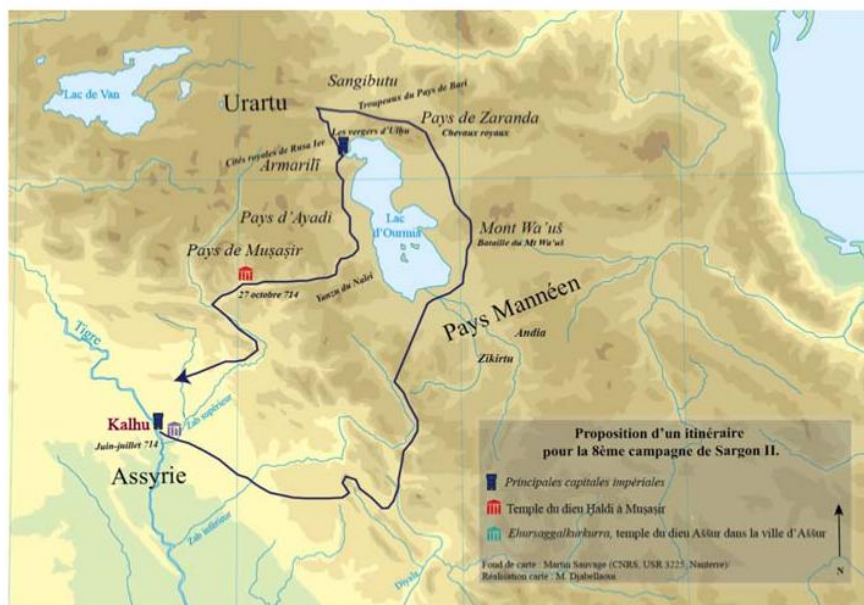
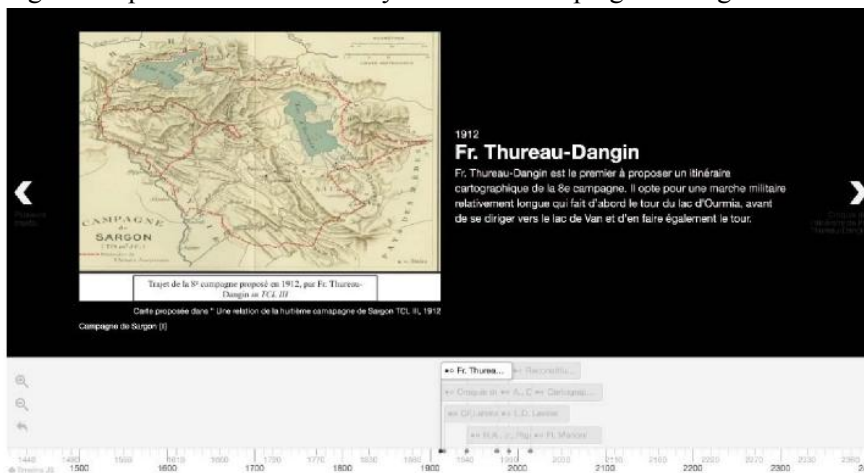
The website *Patrimoine du Proche Orient* presents archaeological sites that are either currently under threat or have already suffered damage as a result of the Near East wars and conflicts of recent years. On the website, one can admire 3D reconstructions of the city of Palmyra or the palace of Khorsabad. In a similar way, *Orient Cunéiforme* aims to raise awareness of the pressing necessity to protect the heritage of Mesopotamia and more specifically to show the crucial historical importance of the written objects.

⁴ George 1992; George 2005/2006, p. 75-95.

This website is not only designed for education but also for the general public. It aims to make aspects of the more recent scientific research accessible to every-body. For instance, the commentary on the Esagil tablet mentions the debates concerning the architectural concept and the measurements of the ziggurat. The segment on the 8th campaign of Sargon II presents different itineraries proposed for the military campaign (Fig. 6) and offers a new solution (Fig. 7). The 3D scanning of the caillou Michaux proposes a new translation of the cuneiform text.

Fig. 6: Chronology of the different hypothesis of the 8th campaign of Sargon II itinerary.

Fig. 7: Proposition of an itinerary for the 8th campaign of Sargon II.



New technologies can also raise new questions for the scholars. For example, when scanning the caillou Michaux, we discovered that no scholar agreed about its material: some proposed that it could be basalt, others diorite. Further scientific analysis is needed to determine its material. Another example is the presentation of the tablet of the 8th campaign of Sargon II that initiated new case studies in geography, in particular, Urartu and Northern Assyria (Mesopotamia) geography. The website can also be useful for the researchers themselves, providing new high-resolution pictures of outstanding cuneiform objects.

In the near future, we are planning to offer filmed interviews with researchers on the website, thanks to the technical support of the Maison d'Archéologie et d'Ethnologie of Nanterre. The objective is to interview scholars and museum curators about the objects presented on the website, in order to introduce the scientific and conservation issues related to them to the public. With the help of these videos, we wish to go deeper into some of the topics discussed on the website, and also to make the general public aware of the methodologies of the scientific research and the most recent discoveries. Video is a medium made for the general public, students and scholars. Through interactive media, the web-site will contribute to making high-level scientific research more accessible for the larger public.

3. Future developments

3.1. The Harradum project

Besides *Orient Cunéiforme*, we have started a new project that will have its place on the website *Patrimoine du Proche-Orient*: a 3D restitution of the city of Har-radum, using the technology of immersive virtual reality with 3D glasses (Oculus Rift and youtube 360).

Harradum, modern Khirbet-ed-Diniye, is located in Western Iraq, near the Eu-phrates. It was excavated in 6 campaigns between 1981 and 1986, directed by Christine Kepinski, before the construction of a dam at Haditha. The site has provided a rich archaeological material as well as cuneiform tablets, published by Francis Joannès.⁵

Thanks to the 3D glasses technology, we would like to give the users a guided tour of the walled city of Harradum, letting them experience the day-to-day life of a small city in Mesopotamia. The level that will be reproduced is level 3B; it is dated to the old Babylonian period, at a time when the city was part of the Baby-lonian kingdom, after the conquest of Mari by Hammurabi. The virtual tour of the city will lead the users from the bank of the Euphrates to the main gate, then through the central street. They will enter some houses, in particular, that of the mayor and the temple dedicated to Adad.

Thanks to this virtual reconstruction we want to show to the public how archaeological artefacts and cuneiform tablets can together help to reconstruct the history of the city. It is also a tool for research. For the moment, only a prototype exists, made by Yohann Janin, showing the elevations of the city walls and buildings as well as its location near the river. The 3D reconstruction gives a distinct

⁵ Kepinski-Lecomte 1992; Joannès 2006; Kepinski 2012.

impression of the narrowness of the streets. It may help to test different hypotheses about the height of the city walls and the access to these walls. The 3D reconstitution will be accompanied by a written commentary presenting the archaeological site and its material and the campaigns of excavations. Some of the excavation archives, including photographs, have already been made available online.

3.2. Other objects and collaborations with museums

This website is indeed a platform for new developments. We would like to enrich this site with other objects kept in France or in other countries. We have already obtained the support of several museums and institutions, in France and abroad, in particular the British Museum, the Chicago Oriental Institute, the Staatsbibliothek zu Berlin. They all have given their permission to publish pictures of the objects they preserve on the website. The virtual museums can help to reinforce scientific collaboration between different countries, and in the future we hope to develop international collaborations.

The 3D scanning of the objects held in France can be an interesting way to develop exchanges between the French and the Iraqi scientific communities. The convention of 3D scanning of the *caillou Michaux* stipulates that the files will be given to the Iraqi Museum of Baghdad. We hope that these exchanges will lead to scientific collaboration between two countries in the future.

Through this article we wish to share our experience of building a website dedicated to the written heritage of Mesopotamia. This site is intended for specialist and non-specialist public, and its ambition is to highlight remarkable objects of the Mesopotamian heritage, to show its historical interest, and to transmit the achievements of the research more widely in the society. 3D and high-resolution photography made it possible to obtain accurate reconstructions of the inscribed objects, which is difficult to achieve by conventional means (e.g. photographs). Interactive media like maps, chronologies, texts and pictures, videos, are interesting tools for the transmission of knowledge. New technologies can therefore be useful for education, research, and raising the public awareness of the Near Eastern heritage. Our wish now is to make this site expand over time and to develop new collaborations at the international level.

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