

## Original Study

Jean Bruant\*

# From Excavation to Restitution of the Networks of Roman and Pre-roman Roads: The Footprints of the 2222 m and 2535 m Leagues in the Carnute, Senon and Parisii Territories (*Gallia Lugdunensis*/France)

<https://doi.org/10.1515/opar-2017-0022>

Received April 18, 2016; accepted October 18, 2017

**Abstract:** The excavation of a section of the *Old path from Orleans to Paris* at Massy has shown a real archaeogeographical textbook case outlining the different phases of the transformation of a gallic sunken road in a gallo-roman road, whose route was used until the Modern period. Outside this focus, the whole of the ancient road has been restituted by observing on the maps the traces left by the use of the Gallo-Roman (2222 m) and the Gallic (2535 m) leagues during the survey campaigns. The cartographic analysis was extended to routes between the cities of Paris, Chartres, and Orleans (fig. 1), and it shows the use of an identical gallic league in Carnute, Senon and Parisii territories and the use of common zero points established on the urban limits for the calculation of the distances. Beyond the restitution of the road networks, this study has revealed that many menhirs, supposedly Neolithic, were in fact standing on points established with the gallo-roman league metric and sometimes directly erected on the limits (*Fines*) of ancient cities. This data allows one to reconsider the dating of the erection of these megaliths, thereby advancing the idea of a *terminus post quem* from the ancient period.

**Keywords:** Roman roads, pre-roman roads, cartographic analysis, road survey, topographic remanence, leaguestones, gallo-roman league (2222 m), gallic league (2535 m), landmarks, standing stones, city limits (*Fines*), dioceses' limits, urban topography, Carnutes, Senons, Parisii, Orleans (*Cenabum*), Chartres (*Autricum*), Sens (*Agedincum*), Paris (*Lutecia*).

## 1 The Restitution of Ancient Road Networks by Topographic Remanence of Leaguestones

In 2009, an excavation campaign undertaken by Inrap at Massy, roughly 15 km south of Paris and at the west end of the Paris-Orly international airport, was prompted by knowledge of the existence of a section of the “Old path from Orleans to Paris” (Bruant, Cotté & Pissot 2014). This section is still perceptible on the maps from the end of the 18<sup>th</sup> century. This road has contributed to the definition of the limits between the

---

**Article note:** This article is a part of Topical Issue on Uncovering Historical Routes for Sustainable Mobility: Methods, Tools and Case Studies.

---

**\*Corresponding author:** Jean Bruant, Inrap (Institut National de Recherches Archéologiques Préventives), Paris, France,  
E-mail: [jean.bruant@inrap.fr](mailto:jean.bruant@inrap.fr)

parishes of Massy and Chilly-Mazarin, which became communes after the French revolution (fig. 2). At the beginning of the Modern period, the *Old Path* was for the most part abandoned and replaced by the *Great royal road from Orleans to Paris*, which was a larger road, better drained and paved – the building of which enabled much time to be saved when travelling from one city to the other.

The archaeological investigation presented an opportunity to verify the long-held hypothesis that the layout of the *Old Path from Orleans to Paris* corresponded, totally or partially, to that of the gallo-roman *Cenabum-Lutecia* road, crossing the territories of the Carnute, Senon and Parisii *civitates* (Dutilleux 1881, Risch 1935, Soyer 1971, Roblin 1971, Oulmont 2002).



Figure 1. Study area in white, with principle centres in red.



Figure 2. Last operating phase of the *Old Path from Orleans to Paris* as observed at Massy (Essonne)/Rue du Pérou before its replacement by the *Great royal road*. © J. Bruant/Inrap.

One of the ancient documents that mentions this roman road is the “Antoninus’ itinerary” (Wirth 1929). It describes the distances between towns in the following way: “CENABVM SALIOCLITA XXIIII SALIOCLITA LVTECIA XXIIII”. The secondary agglomeration of *Saliocita* has been identified as the actual town of Saclas (fig. 3), which is indeed positioned half-way between Orleans and Paris (Naudet 2004). The *Peutingerian Map* (Archier 1979) offers a slightly different distance of 47 leagues (XLVII) between the two cities (fig. 4). In these documents, the distances concerning the *Cenabum-Lutecia* road are not indicated in roman miles, as in *Gallia Narbonensis*, but in leagues – with each league corresponding to 1.5 miles (1500 *passum*: 2222 m). In the *Three Gauls* and the *Germanies*, where this measure was specific, the league approached the local values, which oscillated between 2400 to 2600 m (Chevallier 1997, Dassié 1999, Goudineau 2002), while remaining convertible to the roman mile (1000 *passum*: 1481 m) by a ratio of 2 leagues for 3 miles. The value of this league was presented in the writings of two authors from the end of Antiquity and Early Middle Ages: Ammianus Marcellinus (XVI, 12, 8) and Jordanes in his *Goths History (De origine actibusque Getarum)*, (Ammianus Marcellinus 1978, Jordanes 2000).

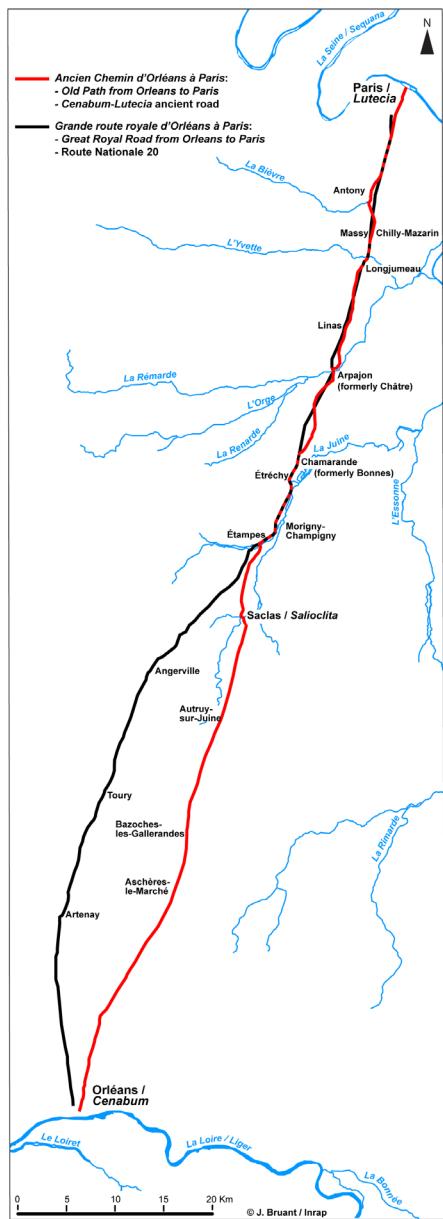


Figure 3. The Old Path from Orleans to Paris (Ancien Chemin d'Orléans à Paris/Cenabum-Lutecia ancient road) replaced during the Modern period by the Great royal road (Grande route royale d'Orléans à Paris). © J. Brant/Inrap.

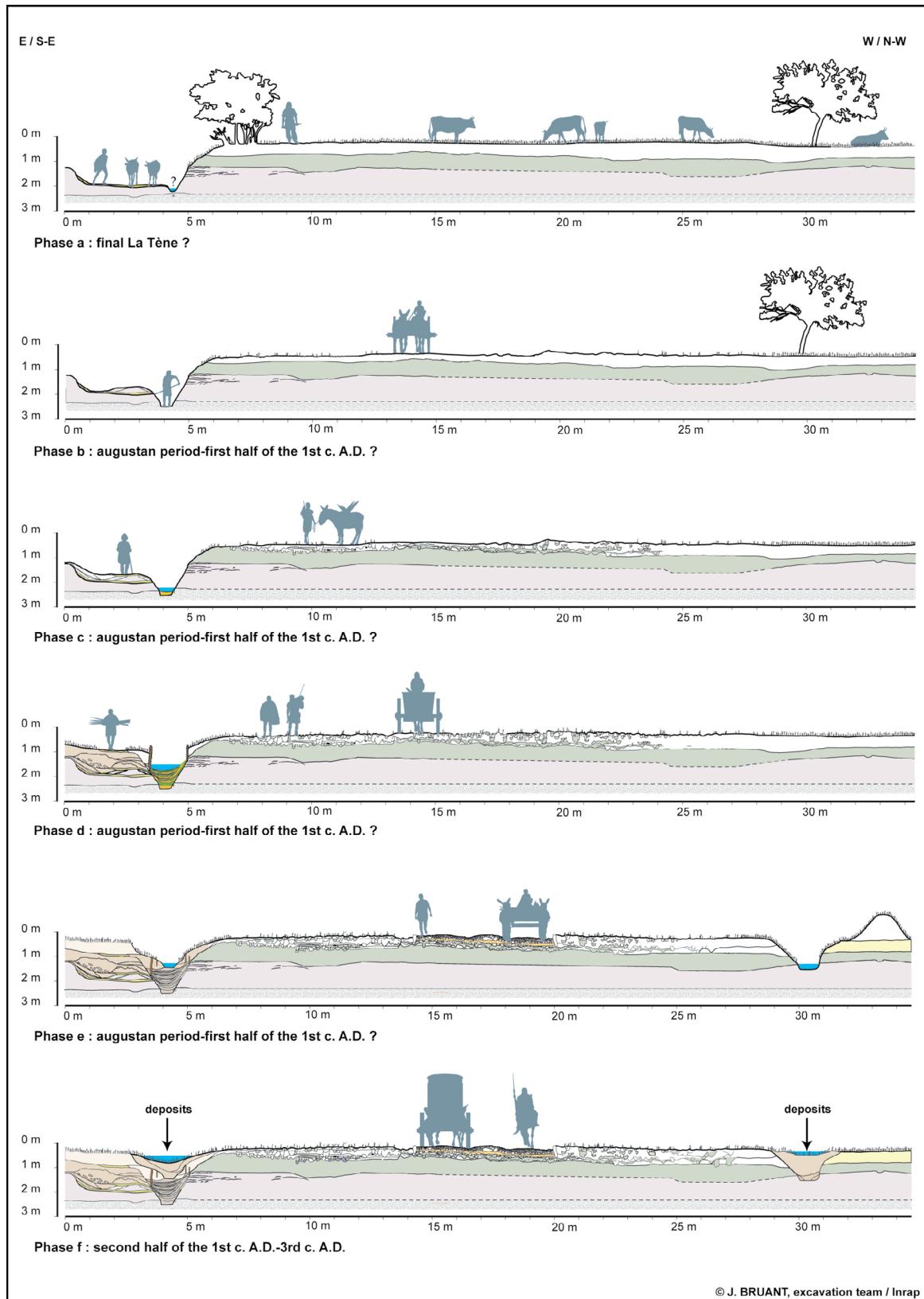


**Figure 4.** Cenabum (Orléans), Autricum (Chartres), Lutecia (Paris), Aquis Segeste (Sceaux-du-Gâtinais) and Agedincum (Sens) on the *Peutingerian Map* (Segment 1).

In the field, the excavation revealed sequences of the road's evolution in a wider chronological range than expected, extending from the end of the Iron Age to the Modern period. One of the most striking features of the excavation campaign was the discovery of a sunken track at the origin of the ancient road. Under the actual communal limits between Massy and Chilly-Mazarin, a vast depression in the ground was traced over a distance of about 257 m to a depth of a little over 2.10 m, and a width of 4 to 6 m, which is sufficient for the movement of carts (fig. 5.a). No secure dating elements have been found from the sunken track, but this absence was compensated by the data originating from other preventive archaeological operations in a radius of 1.5 to 7 km. The remains found were mainly from the Late La Tène occupations (150–30 BC), where some of the ditches were obviously positioned in orientation with the sunken track (Bruant 2016).

In the three centuries following the Roman conquest (fig. 5.b to 5.f), several changes can be observed. The first four phases recorded by the stratigraphy attest to an increased investment in the road equipment, leading to an *apex*: a causeway with two deep lateral ditches. The transformations undertaken in the last phase could be understood as maintenance in degraded mode manifested by a modification in the drainage system. In this case, larger and shallower swales (Ellis et al. 2004) were created to absorb part of the runoff, rather than rerouting it downstream (the other part being drained by evapo-transpiration). These swales seem to have replaced the former lateral ditches that were probably more costly to maintain.

Beyond the evolution of the road (documented in the field at Massy) the study was broadened to assess the possible correlation between the *Old Path* and the roman road. To achieve this, a cartographic analysis was undertaken. This work has taken into account the entire route of the road between Orléans and Paris, using some innovative work from archaeologists and geographers who, in the 1960s, developed a method to reconstruct gallo-roman roadways on the basis of topographic remanence (Chevallier, Clos-Arceduc & Soyer 1962, Clos-Arceduc 1964). It involves the observation of the road network as it appears on current or ancient maps, and therefore the identification of some remarkable topographical markers, which correspond to the resurgence of milestones set according to the ancient measurement grid. The existence of these topographical points is related to the fact that the ranging markers used during surveying campaigns have played – and continue to play, even after their disappearance – the



**Figure 5.** The restitution of the *Cenabum-Lutecia* road evolution (Late La Tène-gallo-roman period) based on the observations made during the excavation campaign lead by Inrap in Massy (Essonne)/Rue du Pérou. © J. Bruant, Équipe de fouille/Inrap.

role of attraction points on the roads. Most frequently, range markers appear as “ghosts”, in the shape of cross-roads, churches or administrative or ecclesiastical boundaries. Markers also appear in the form of toponyms: mostly crosses, montjoies, gallows and stones. When dealing with outstanding trees, we notice that the elm is often mentioned.

These observations were made by generating a compiled map based upon the current background (scale 1/25,000), for which data originating from orthorectified 18<sup>th</sup>/19<sup>th</sup> century charts and aerial photos – both available on the [www.geoportail.gouv.fr](http://www.geoportail.gouv.fr) site of the Institut Géographique National – have been integrated.

In the areas studied here, the measurement grid sought for between the markers is, as already indicated, the gallo-roman league of 2222 m (fig. 6, 7). Between Orleans and Paris, the analysis has revealed a nearly continuous pattern of conspicuous markers on the *Old Path*. This observation would confirm the hypothesis of its correspondence with the roman road (fig. 3).

Nevertheless, it should be pointed out that the means used for the study cannot provide absolute precision in the tracing of the roads and the layout of the markers. There are three main reasons for any deviations from the central value of 2222 m:

- First, an offset in the coordinates x, y, or z between the real location of the old road and its supposed trajectory (fig. 5).
- Second, a shift between the distances obtained by the ancient surveyors and the measurements made on the maps, whose characteristics correspond to a horizontal distance that does not take account of any altimetric profile of the trace.
- Third, a displacement between the original position of the leaguestone and that of its “ghost”, according to the manner of the emplacement of the latter.

However, several cases of hiatuses have been recorded, each one displaying a correlation with the ways the territory is organized. These disruptions in the pattern required by the gallo-roman (2222 m) metrics were recognized while crossing secondary agglomerations on the route of the road (*Salioclita*/Saclas, Arpajon), and also on the boundary separating the dioceses of Paris and Sens between the communes of Chamarande and Étréchy, apparently overlaying one of the *fines* separating the Parisii and Senon territories (fig. 7, 9, 10). It should be noted that the toponym of Chamarande appeared in the 18<sup>th</sup> century replacing Bonnes, whose etymology comes from late Latin *bodina* (landmark or *Borne* in French), which became *bodne* in old French, then *bone* or *bonne* (Gendron 2006: 78). The latter’s presence at that particular place reinforces the notion of a link between the survey of the road and the establishment of limits between the territories.

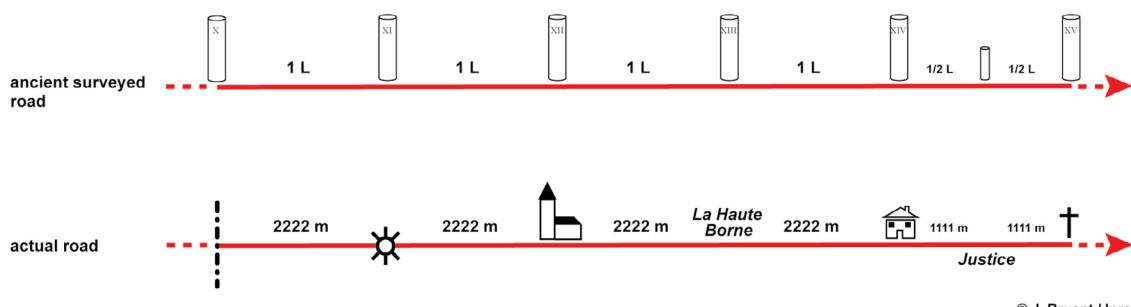
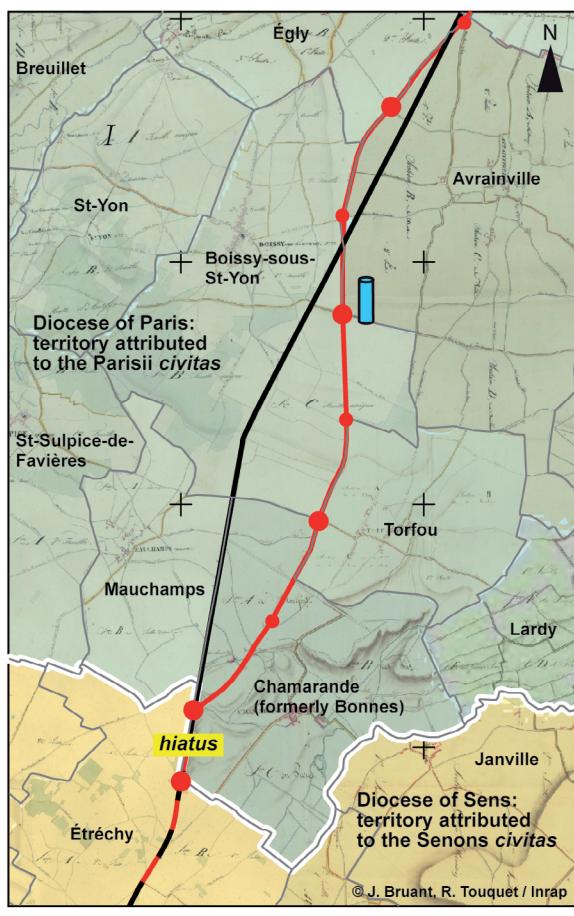


Figure 6. The topographical remanence of the leaguestones on the road networks. © J. Bruant/Inrap.



- Old Path from Orleans to Paris / Cenabum-Lutecia road
- Great Royal Road from Orleans to Paris
- parish / communal limits
- leaguestone presumed location (2222 m metric)
- intermediary leaguestone presumed location  
(½ league: 1111 m module)
- modern parish boundary landmark between Avrainville and Boissy-sous-Saint-Yon

**Figure 7.** Traces of landmarks on the *Old Path from Orleans to Paris* showing a hiatus between the supposed territories of the Parisii and the Senons (orthorectified napoleonian cadastre) © J. Bruant, R. Touquet/Inrap.



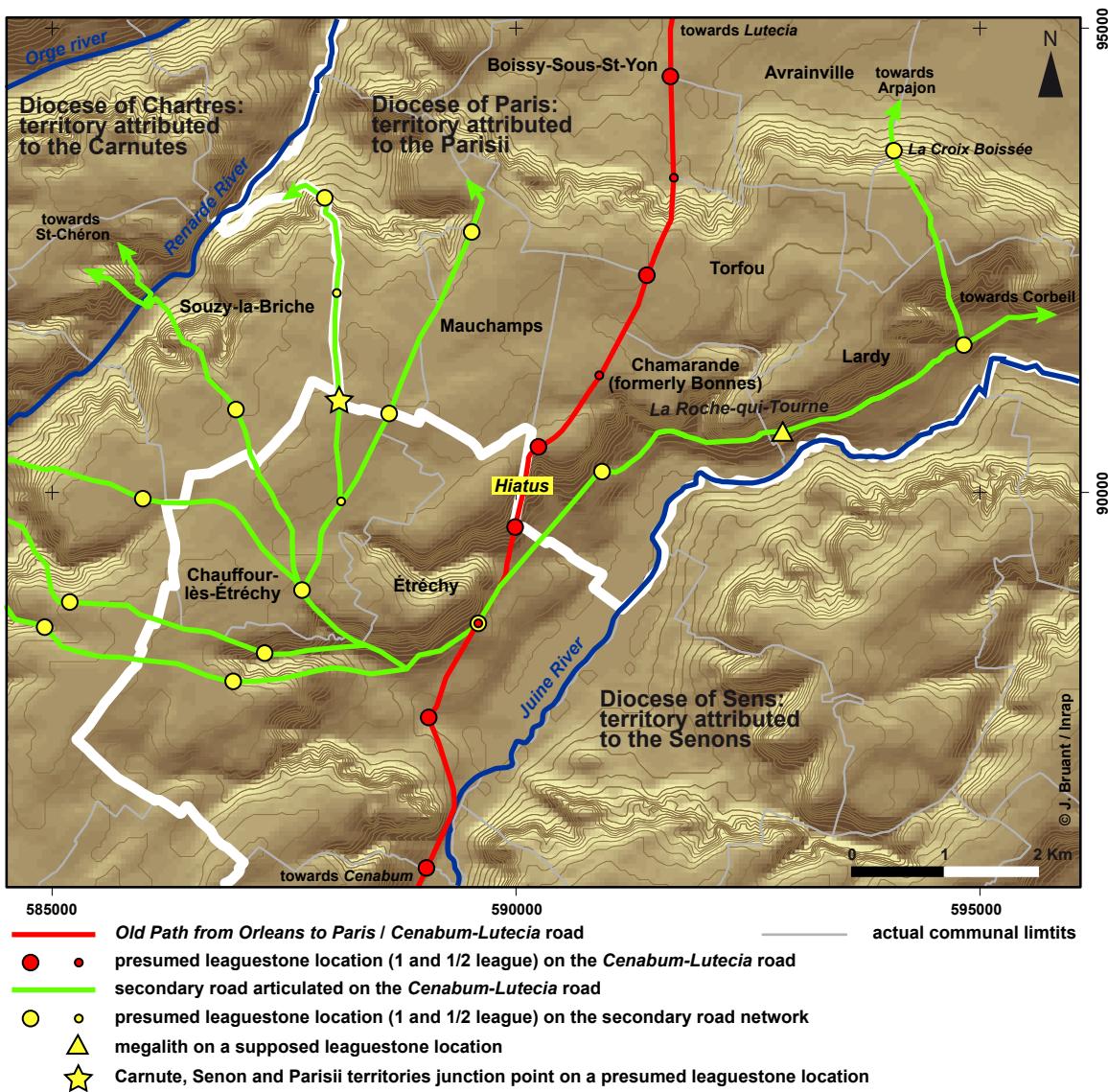
**Figure 8.** Parish limit marker between Avrainville (AV on the stone) and Boissy-sous-Saint-Yon along the *Old Path* at the supposed location of a gallo-roman leaguestone. © J. Bruant/Inrap.

## 2 On the Question of Megaliths on the Road and Hydrographic Networks; Their Relationship to the Supposed City Limits (Fines)

Beyond the question of the correlation between these two roads, this study has also been extended, using the same methodology, to the network of secondary roads (*viae vicinales*) branching off from the *Cenabum-Lutecia* road. With this in mind, a virtual testing lab was opened in the southern half of the Essonne department, where the territorial confines of the Carnutes, Senons and Parisii, (whose *fines* are supposed to correspond to the dioceses of Chartres, Sens, and Paris), are located (fig. 9, fig. 10). Here, the limits have been established from the communal division.



**Figure 9.** The map of the study area as generated from the virtual testing lab opened in the south of the Essonne department showing the relationship between the positions of certain megaliths, one of the supposed leaguestones every 2222 m and the dioceses/*civitates* (?) limits. © J. Bruant, R. Touquet/Inrap.



**Figure 10.** Implication of road survey in the delimitation of the dioceses of Paris, Chartres and Sens and the *civitates* of the Parisii, the Carnutes and the Senons. © J. Bruant, R. Touquet/Inrap.

This work has revealed an important number of routes paced by the measurement of the gallo-roman league (2222 m), originating from the leagestones of the *Cenabum-Lutecia* road. At Étréchy, the observed overlap between the territorial confines of Carnutes, Senons, and Parisii, and the supposed location of a leagestone related to the *Cenabum-Lutecia* road, illustrates this phenomenon very well. We can see here a close link between the position of the leagestones and the drawn limits of the supposed ancient Carnute, Senon and Parisii *civitates*.

Among the forms taken by this resurgence of leagestones on the secondary roads, four standing stones can be singled out, hitherto attributed to the Neolithic period and a lone rock (Peek 1975, Bénard 2012). Two occurrences are related to routes whose “point zero” is set on the *Cenabum-Lutecia* road, and two others form part of the outlines of the dioceses/city limits (Bruant, Touquet 2016).

On a layout of a secondary road, surveyed from Arpajon and recognised in the Essonne Valley up to Malesherbes (Loiret) over a distance of at least 19 leagues (about 42 km), two megaliths were associated with supposed league points due to archeogeographical analysis. This path could lead to secondary

agglomerations such as Pithiviers-le-Vieil and Beaune-la-Rolande on the road to Orleans or Château-Landon (*Vellaunodunum*) on the way to Sens (*Agendicum*), but also to the water sanctuary of Sceaux-du-Gâtinais (*Aquis Segeste*), which is mentioned in the *Peutingerian Map* (fig. 4). Located in Itteville and straightened on the spot in 1994, the *Roche-à-Gentil* is a 3.80 m high sandstone megalith currently positioned 27 m from the road, where there were observed traces of antique demarcations (fig. 9, 10, 11). Recently discovered in Maisse by prospectors from the Rock Art Research and Study Group GERSAR (Groupe d'Étude et de Recherche sur l'Art Rupestre), the *Pierre Droite* (fig. 9, 12) is the second megalith associated with a demarcation spot as a result of such mapping analysis. In squared sandstone, this standing stone presents more modest dimensions than the previous one, as it is only 1.4 m high.



Figure 11. The *Roche à Gentil* menhir in Itteville (Essonne). © J. Bruant/Inrap.



Figure 12. The *Pierre Droite*: a standing stone recently discovered in Maisse (Essonne) by the GERSAR. © J. Bruant/Inrap.



Figure 13. The *Roche-qui-Tourne* in Lardy (Essonne). © J. Bruant/Inrap.



Figure 14. The *Pierrefitte* menhir lies on the communal limit between Étampes and St-Hilaire (Essonne). The location is also the boundary between the dioceses of Chartres and on the presumed *fines* between the Carnutes and the Senons. © J. Bruant/Inrap.

In Lardy, near the communal limit of Chamarande, another form of megalith could be associated with the secondary road demarcations. In this case, it concerns a termination coming from the same landmark as the one that would have been used as a zero point of the network related to the delimitation of Paris, Chartres and Sens dioceses. However, the *Roche-qui-Tourne* (fig. 9, 10, 13) is not a monolith, but a cairn made of two large sandstone blocks, which are superposed and currently measure close to 3.20 m high. Careful observation of this very unevenly shaped sandstone sitting on a pedestal, revealed traces of voluntary fracturing at its base using wooden corners.

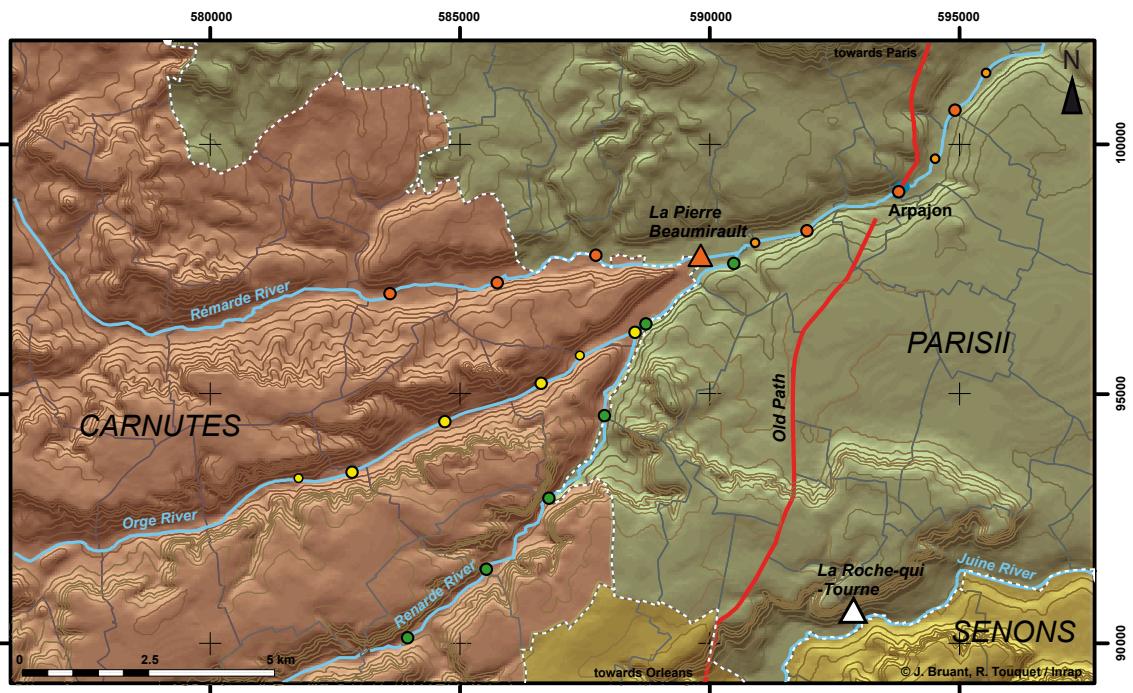
This set-up gave rise to some local folklore. According to one version, the stone would turn around on itself every one hundred years at midnight provided that a white pigeon landed at the top and that the witness was turning his back. Healing virtues are equally linked to the megalith, namely to cure numerous bowel diseases afflicting the local population.

Discovered in the 19<sup>th</sup> century in the context of the dismantling of a murger in Étampes, at the limit of the commune of St-Hilaire, Pierrefitte's sandstone menhir (fig. 9, 14) is 3.20 m high. Studied as part of an antique path survey, this stone appeared, not only at the junction of two surveyed networks, but also on the limit separating Chartres and Sens dioceses, potentially coming from the *fines* separating the Carnutes from the Senons.

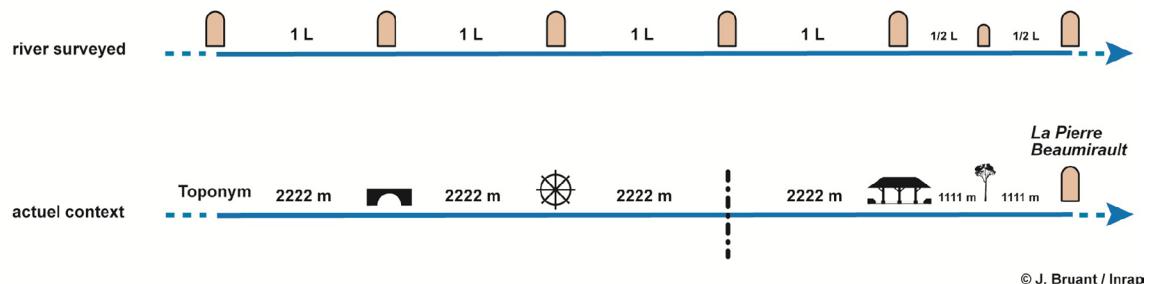
In Bruyères-le-Châtel the *Pierre Beaumirault* (fig. 9, 15), situated not far from the confluence of the *Orge* and the *Rémarde* rivers, is also associated with the limits of two dioceses, this time between Paris and Chartres. Unlike the previously mentioned megaliths, this one is not linked to any road network, but rather to a hydrographic one. Here, the usual gallo-roman (2222 m) league measurements on the roads have also been identified on these rivers. They appear in cartographic analyses as a succession of bridges, ecclesiastic and administrative boundaries, watermills and washing-houses; all regularly spaced by 1 league,  $\frac{1}{2}$  league, or  $\frac{1}{4}$  league (fig. 16, 17). When compared with ancient documents, the traces of surveying and marking along the riverside can relate to some miniatures in surveying treatises (fig. 18, 19), such as the *Gudianus manuscript* from Antiquity (fig. 58 Th ou 61 La, *Ms Gudianus*) (Blume et al. 1848, Hyginus Gromaticus et al. 1971), and the *Carpentras* manuscript of Bertand Boisset (Carpentras, Bibliothèque Inguimbertine, *Ms. 327, f. 293 v.*), dating back to the end of the Middle Ages (Portet 2004).



**Figure 15.** The *Pierre Beaumirault* (Bruyères-le-Châtel/Essonne): front and side views. © J. Bruant/Inrap.



**Figure 16.** The map indicating the location of the *Pierre Beaumirault*: a leaguestone on a river system surveyed with the 2222 m metric.



**Figure 17.** The topographical remanence of theoretical leaguestones on hydrographic network. © J. Bruant / Inrap.



**Figure 18.** Ancient river landmarking as a testimony from the Gudianus manuscript (fig. 58 Th ou 61 La ; Ms Gudianus). © Herzog August Bibliothek, Wolfenbüttel.



**Figure 19.** River surveying techniques used during the XIV<sup>th</sup>-XV<sup>th</sup> from the Carpentras Manuscript of Bertran Boisset (Ms. 327, f° 293 v.). © Bibliothèque Inguimbertine, Carpentras.

With this data, it is now possible to propose a *terminus post quem* for the placement of these features as the markings of ancient networks. This chronology is also consolidated by the results of recent soundings undertaken in other regions of France, in the trenches of some supposedly Neolithic menhirs (fig. 20, 21). Megaliths such as the *Pierre Piquée* (2.40 m high) erected in Aubière (Puy-de-Dôme) and the *Métayer* (n°1) in St-Paul-d'Eyjeaux (Haute-Vienne) have recently delivered gallo-roman ceramic pieces during the excavations of their foundation pits (Surmely 2012, Crescentini & Vuallat 2002).



**Figure 20.** The *Pierre Piquée* menhir in Aubière (Puy-de-Dôme). © G. Bonhomme.



**Figure 21.** The *Métayer* menhir in St-Paul-d'Eyjeaux (Haute-Vienne). © J.-L. Capdeville.

Quite different from the standardized and often cylindrical stones encountered on the path of major roads, the megaliths studied in Essonne attest to a variability in the forms used. Leaving aside their dimensions, these standing stones show also similarities with some fairly basic markers found in parts of the French Alps, such as the Jaijal pass landmark which marks the limit between the Céutrons' and the Allobroges' territories, but equally between two provinces: *Alpes Graiae* and *Gallia Viennensis* (fig. 22). The granite monolith bears the inscription "FINES" (Acolat 2005, 2016). Nowadays, the pass makes the division between the Tarentaise and Geneva dioceses, but also between the Savoie and Haute-Savoie departments and the Cordon and La Giettaz communes.



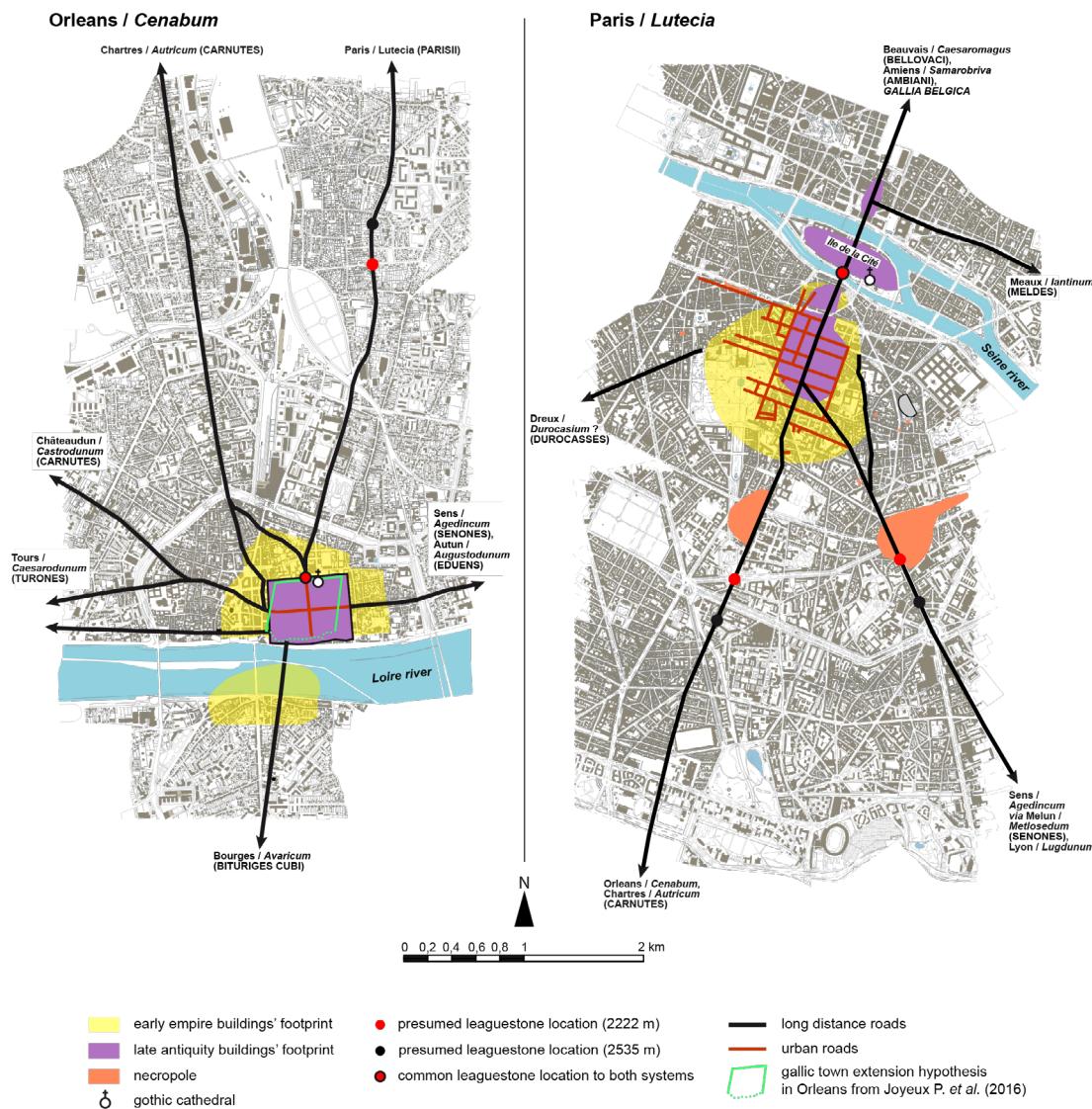
**Figure 22.** The boundary landmark (*Fines*) between the Céutrons and the Allobroges territories at Le Jaijal pass (Haute-Savoie/French Alps), which is also on the communal limits between Le Cordon and La Giettaz. © Association La Giettaz et son Patrimoine.

### 3 «Zero Points» and Urban Topography

Returning to the phenomena observed on the Orleans-Paris axis, one of the most important aspects remains the determination of the "zero points" on the road in each city. In Orleans, as in Paris, the same configuration can be noticed: a correspondence between the location of the "zero points" and the limitations of the cities' walls during Late Antiquity (fig. 23).

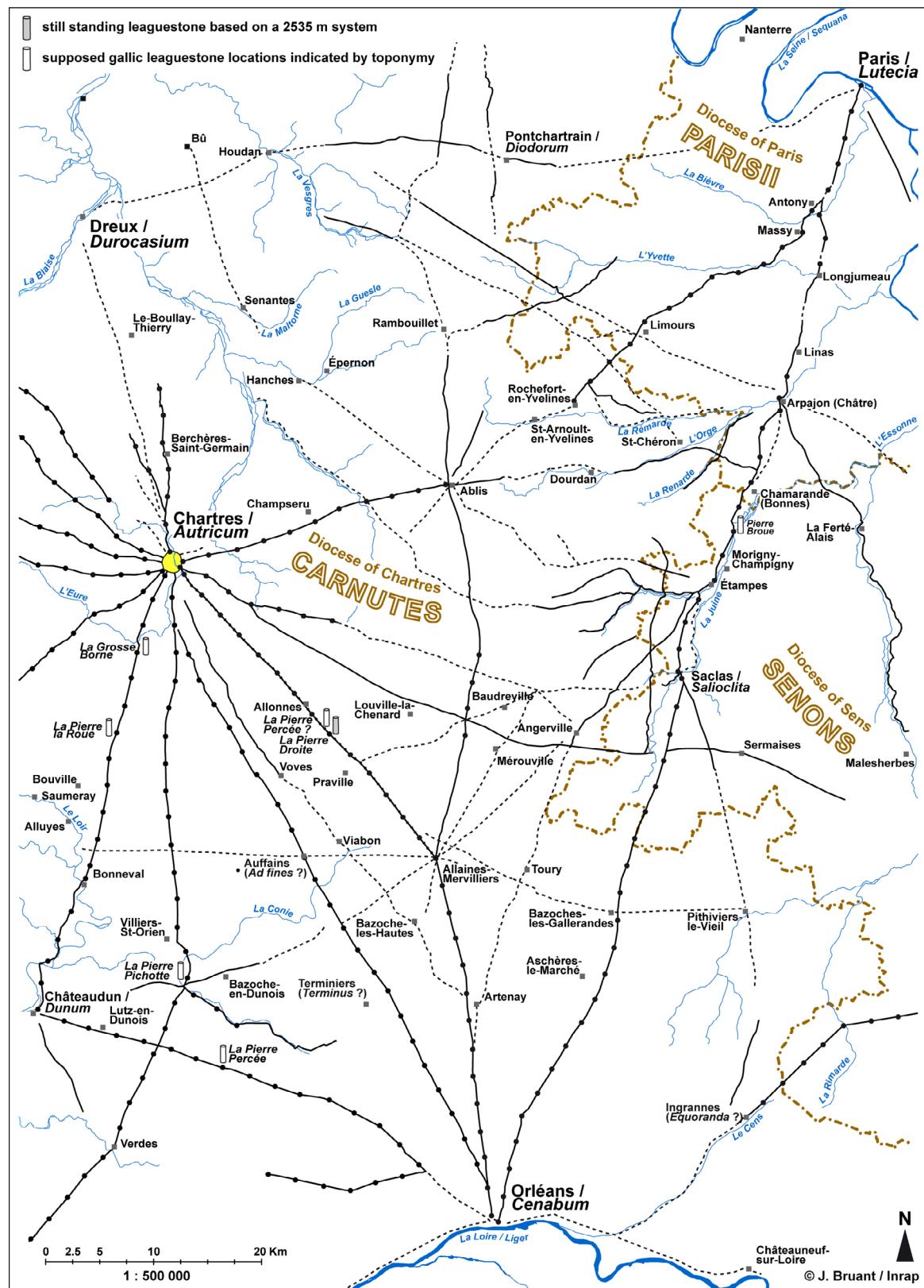
In Orleans, the supposed "zero point" is positioned on the north gate of the city walls, located at north of the *Cardo Maximus*, and near the start of the road to Chartres (Debal 1980, Vilpoux 1998). In the same way in Paris, between Early and Late Antiquity, the left bank was partly abandoned and the urban space retracted from 100 to 25 ha (Roblin 1951, Busson 1998, Direction des affaires culturelles de Paris et Paris musées 2011). The centre of power moved to the *Île de la Cité*, which was then defended by a fortified wall. In this case, the supposed "zero point" could correspond to the position of the south gate of the enclosure. It is worth noting that near both of those places gothic cathedrals were set up, Sainte-Foix in Orleans and Notre-Dame in Paris.

These "zero points" are particularly important as they articulate with the second part of this work, which used exactly the same methods as above to determine whether or not the ancient roads re-used the routes of more ancient paths, whose traces were left by an underlying metric: an eventual gallic league. This time, another metric has been identified on the track, without any correspondence to any ancient, medieval or modern unit of measure: a significantly longer metric than the gallo-roman league of 2222 m, and with a central value of 2535 m, which has been continuously observed between Orleans and Arpajon and can also be found between Antony and Paris (fig. 24).

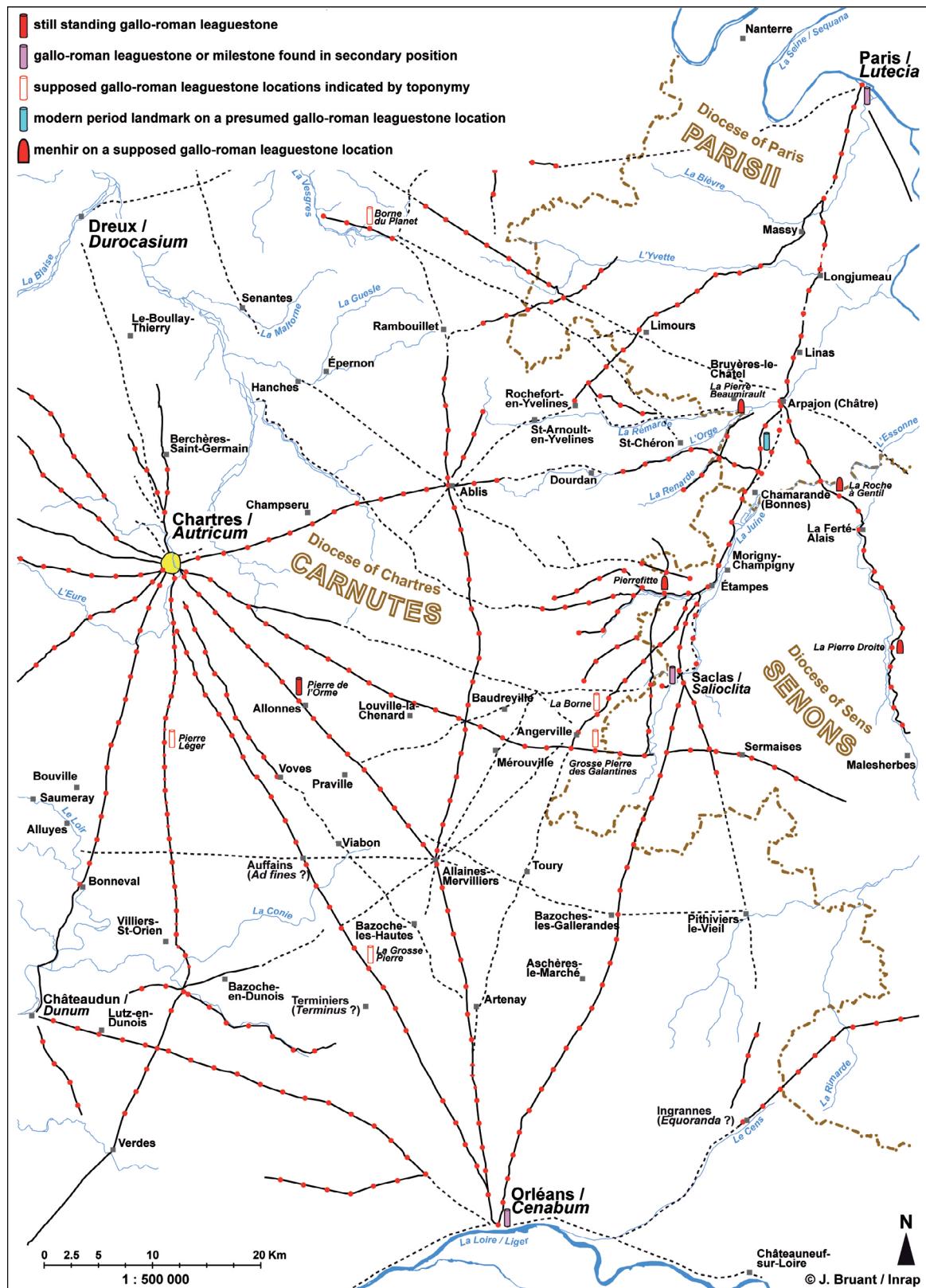


**Figure 23.** Presumed leagestone location (2535 m and 2222 m systems) superimposed upon the topography of Orleans/Cenabum and Paris/Lutecia. © J. Bruant, S. Eusèbe, R. Touquet/Inrap.

This work has shown that the “zero points” of the restored road precisely corresponded to those that were determined with the 2222 m league (fig. 23, 25). Faced with archaeological data, in Orleans the “zero point”, established with the supposed gallic metric (2535 m), could also be in agreement with certain assumptions based on the gallic proto-urban metric extending during the Late La Tène (Joyeux et al. 2016). In Paris, the “zero point” determined with the gallic (2535 m) metric was also positioned on the southern shore of the *Ile de la Cité*. Despite this information, these chronological and geographical clues could not allow us to establish whether this metric, or at least its use for the demarcations of the track, was before or after the Roman conquest. The only feasible strategy left was to obtain dating elements, absolute or relative, keeping in mind that there could be a difference between when the terminals were located, and when secondary roads, buildings or occupations were built. This is why the investigations have been extended to a much wider geographical area including the northern part of the Centre region, an area marked by the existence of a network dense with roads, where Chartres/Autricum was the main oppidum (Guérineau de Boisvilllette 1861, Jalmain 1972, Cribellier & Ferdière 2012).



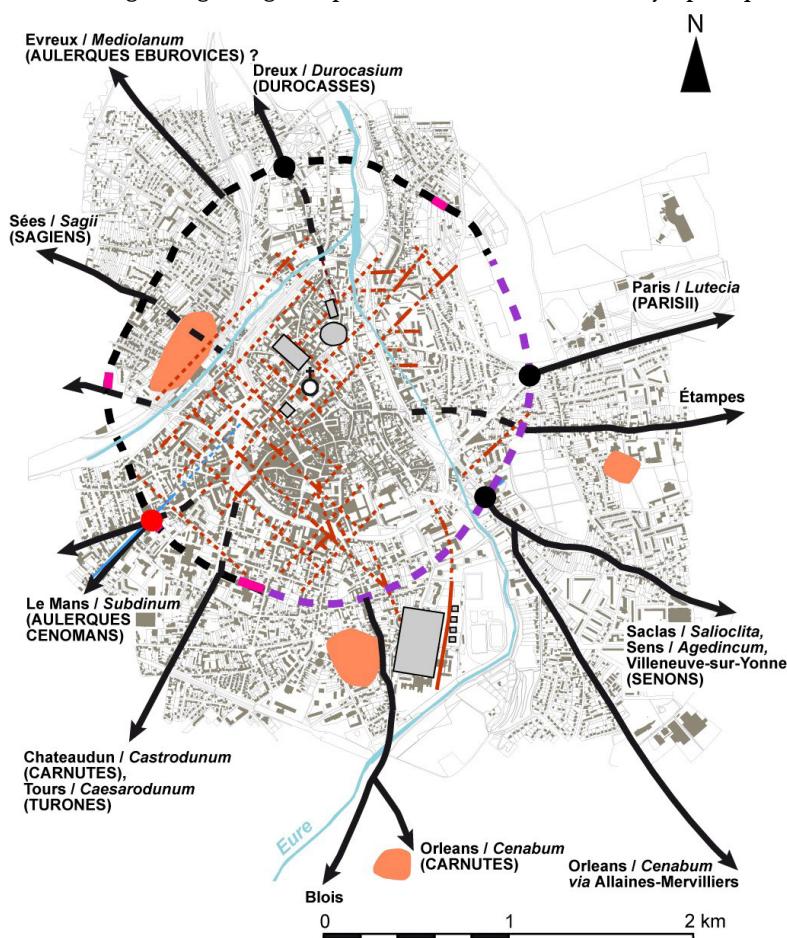
**Figure 24.** Presumed leageystone location (2535 m) on the network of roads between Orleans/*Cenabum*, Paris/*Lutecia* and Chartres/*Autricum*. © J. Brant/Inrap.



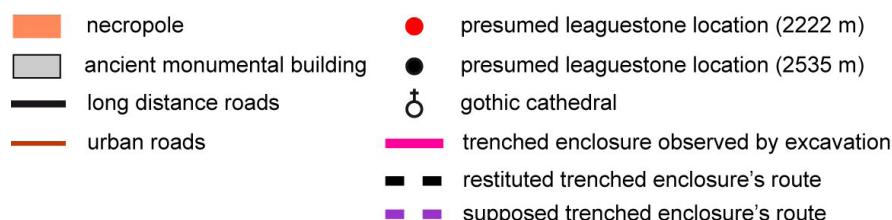
**Figure 25.** Presumed leaguestone location (2222 m) on the network of roads between Orleans/Cenabum, Paris/Lutecia and Chartres/Autricum. © J. Bruant/Inrap

In the zone studied (fig. 24, 25), two important facts are noteworthy: namely the presence of the two metrics on the same axes, and the fact that the 2535 m league is present in at least three different areas – namely Carnute, Senon and Parisii. In a detailed analysis, many associations are apparent among these points, not only with toponyms evoking the presence of disappeared landmarks, but also with landmarks still in place. If we consider the anepigraph landmarks standing on the Chartres-Orléans road, between Beauvilliers and Allones (Caylus de 1761, Merlet 1870, Ollagnier & Joly 1994), they suggest that their locations were dictated by two different metrics, namely 2535 m for the *Pierre Droite* and 2222 m for the *Pierre de l'Orme*.

The configuration of *Autricum* (fig. 26), the main *oppidum* of Carnutes, could provide some dating elements for part of the network as revealed by the cartographic analyses. For this city, where the ancient phases of occupation are documented by a large number of excavations, especially for Late Antiquity, very few elements regarding the gallic period were uncovered. Many open questions remain concerning the



© J. Bruant, R. Touquet / INRAP from Joly, Gibut (2009), Ben Kaddour C., Rivet J. (2016).



**Figure 26.** Presumed leageystone location (2535 m and 2222 m systems) superimposed upon the topography of Chartres/*Autricum*. © I. Briant, R. Touquet/Inrap.

dating of the vast, trenched enclosure that circumscribes the city. With a diameter of about 1.8 km, a depth of 5 m, and a width of up to 10–12 m for the V ditch (Joly & Gibut 2009, Joly 2013, Ben Kaddour, Gibut & Rivet 2016), this enclosure has impressive dimensions. This enclosure clearly evokes the monumental, massive henge adjustments from the end of the Iron age visible in Reims (Marne)/*Durocortorum* and in Manching, Germany (Fichtl 2006). In terms of dating, it is important to stress that currently there is no evidence for this trenched enclosure being created before La Tene D2 b (50–30 BC). It is known that it was in use during the 1<sup>st</sup> century AD and almost completely abandoned during the course of the 2<sup>nd</sup> century.

Taking into account these parameters, the urban topography of Chartres shows the junction of at least three “zero points”, established with the gallic league (2535 m) metric, directly on the route of the enclosure, with a majority of points on the right bank of the Eure river. These elements constitute a first preliminary dating index for the networks surveyed with this metric. These dates seem, for the moment, relatively late, and could even spill over into the gallo-roman period.

## 4 Conclusion

Since the introduction of the breakthrough in the methods analysing ancient paths and roads in time and space by Eric Vion (1989), considerable advances have been made in the understanding of the dynamics of road networks by a number of proponents in archaeogeography (Chouquer 1997, Leturcq 1997, Marchand 2009, Robert 2011, Watteaux 2010, Robert & Verdier 2014). These researchers considered road networks as both starting and central points in their studies. Although these works agree on the idea that a network is not only made of links, but also of points, the question of road markings has not been fully integrated as an active component of the system. The exploration of the road networks of the Carnutes, Senons and Parisii cities by the restitution of the geographical position of their road markers show to what extent survey campaigns played, and continue to play, a major role in constitution and evolution of the territory. Almost two millenia after the implementation of league stones, their topographical remanence and the variability of shapes taken by their ghosts, corroborate the general phenomenon linked to past shapes, in so far as “their transmission is not explained by the fixation of a material element, once and for all, but by its endless renewal within a complex set of reinterpretations<sup>1</sup>” (Robert 2003: 1). If we consider menhirs, which were potentially removed or reused as landmarks on the paths, several other topics concerning the eras dating back to the Neolithic could be linked to the markings on the road networks.

What remains to be done now, is to date as accurately as possible the road survey campaigns that have employed the 2535 and 2222 m metrics by attempting to clarify their relationship within the Romanisation process. Indeed, if we can find traces of the use of the 2222 m league in the regions studied, the fact that the 2535 m league (for which the origin, the calculation base and the dissemination area are unclear) might be found in the same territory would not be coincidental. This would suggest that there was already a form of political and administrative harmonisation, for which the details remain to be discovered. The question, obviously, is to know whether this normalisation happened before or after the Conquest, and if it was driven from the outside or not. A widening of the study area and the integration of dating elements from preventive and planned archaeology, as well as combining aerial and satellite surveys, will thus be necessary before sketching out any scenarios.

## References

Acolat, D. (2005). Représenter le paysage antique: Des normes des arpenteurs romains aux témoignages épigraphiques (IIe-IXe siècle). *Histoire & Sociétés Rurales*, 24(2), 7–56.

<sup>1</sup> “Ainsi, la transmission des formes ne doit plus être appréhendée comme une transmission linéaire dans le temps et dans l'espace mais comme le résultat de processus mettant en œuvre différentes échelles et différents réseaux. La transmission des formes ne s'explique plus par la fixation d'un élément matériel, une fois pour toute, mais par son incessant renouvellement au sein d'un jeu complexe de réinterprétation”.

Acolat, D. (2016). Le bornage des confins en haute et moyenne montagne dans les Alpes romaines : espaces de marges, espaces marginalisés, espaces finalisés ? Un exemple : la Haute vallée de l'Arve et du Val d'Arly en Haute Savoie. In: C. Besson, O. Blin, B. Triboulot (Eds.), *Franges urbaines et confins territoriaux. La Gaule dans l'Empire*. Colloque International, 29 février-3 mars 2012, Versailles (78). (pp. 601-618). Bordeaux: Ausonius.

Ammianus Marcellinus. Galletier, E. (Ed.). (1978). *Histoire. Tome 1, Livres XIV-XVI*. Paris: Les Belles Lettres.

Archier, E., Peutinger K. (Ed.). (1979). *Tabula itineraria ex illustri Peutingerorum bibliotheca quae Augustae Vindel. est beneficio Marci Velseri septemuiri augustani in lucem edita*. Saint-Julien: Editions de Sancy.

Bénard, A. (2012). *Les mégalithes de l'Essonne*. Chamarande: Société historique et archéologique de l'Essonne et du Hurepoix.

Ben Kaddour, C., Gibut P., Viret, J. (2016). Secteur nord-est de Chartres à la lumière de trois fouilles récentes (Hubert Latham, Clos-Vert et Grandes-Filles-Dieu). In: C. Besson, O. Blin, B. Triboulot (Eds.), *Franges urbaines et confins territoriaux. La Gaule dans l'Empire*. Colloque International, 29 février-3 mars 2012, Versailles (78). (pp. 139–154). Bordeaux: Ausonius.

Blume, F., Lachmann K., Rudorff. A. (1848). *Die Schriften der römischen Feldmesser*. Berlin: Georg Reimer. <https://archive.org/stream/dieschriftender00mommgoo#page/n41/mode/2up> (04.02.2016).

Bruant, J., Cotté, O., Pissot V. (2014). La voie de grand parcours Orléans-Paris à Massy/ Rue du Pérou. In: S. Robert, N. Verdier, *Dynamique et résilience des réseaux routiers: archéogéographes et archéologues en Ile-de-France*. (pp. 133–149). Tours: Fédération pour l'édition de la revue archéologique du Centre de la France.

Bruant, J., Touquet, R. (2016). Menhirs ou bornes leugaires antiques ? Des mégalithes aux confins des territoires carnute, sénon et parisii à l'épreuve de l'analyse cartographique. In: C. Besson, O. Blin, B. Triboulot (Eds.), *Franges urbaines et confins territoriaux. La Gaule dans l'Empire*. Colloque International, 29 février-3 mars 2012, Versailles (78). (pp. 357–380). Bordeaux: Ausonius.

Bruant, J. (2009). Étude d'un tronçon de l'axe Paris-Orléans. *Archéopages, Voies et réseaux*, 27, 58–59.

Bruant, J. (2016). Origines protohistoriques des voies de grands parcours antiques en territoires carnute, sénon et parisii. Éléments fournis par l'archéologie préventive et l'archéogéographie. In: G. Blancquaert, F. Malrain (Eds.), *Évolution des sociétés gauloises du Second âge du Fer, entre mutations internes et influences externes: actes du 38e colloque international de l'AFEAF, 29 mai-1er juin 2014*, (pp. 19–33). Amiens. Senlis: Revue Archéologique de Picardie 2016.

Busson, D. (1998). Paris. *Carte archéologique de la Gaule 75*. Paris: Académie des Inscriptions et Belles-Lettres.

Caylus de, A.-C.-P. (1761). *Recueil d'antiquités égyptiennes, étrusques, grecques et romaines Vol. IV*. Paris: Dessaint et Saillant.

Chevallier, R. (1997). *Les voies romaines*. Paris: Picard.

Chevallier, R., Clos-Arceduc, A.-G., Soyer J., Groupe d'archéologie antique du Touring-Club de France (1961). *Organisation de la recherche des voies antiques*. Paris: Touring-Club de France.

Chevallier, R., Clos-Arceduc A.-G., Soyer J. (1962). Essai de reconstitution du réseau routier gallo-romain. Caractères et méthodes. *Revue Archéologique*, 1962(1), 1–49.

Chouquer, G. (Ed.). (1997). *Les formes des paysages. 3, L'analyse des systèmes spatiaux*. Paris: Éditions Errance.

Clos-Arceduc, A.-G. (1964). La métrique des voies gallo-romaine et ses rapports avec leur recherche. In: *Colloque international d'archéologie aérienne, 31 août-3 septembre 1963*, Paris, France. (pp. 213–217). Paris: S.E.V.P.E.N., École pratique des hautes études.

Crescentini, D., Vuillat. D. (2002). Le menhir n°1 du Métayer à Saint-Paul-d'Eyjaux (Haute-Vienne). *Préhistoire du Sud-Ouest*, 9, 213–217.

Dassié, J. (1999). La Grande lieue gauloise: approche méthodologique de la métrique des voies. *Gallia*, 56, 285–311.

Debal, J., Société archéologique et historique de l'Orléanais (Ed.). (1980). *Le Plan d'Orléans à travers les siècles*. Orléans: Société archéologique et historique de l'Orléanais.

Direction des affaires culturelles de Paris et Paris musées, Mousseaux M.-R., Robin S. (Eds.). (2011). *Et Lutèce devint Paris... métamorphoses d'une cité au IVe siècle*. Exposition, Paris, Crypte archéologique du parvis de Notre-Dame, 15 mars 2011-26 février 2012. Paris: Paris musées.

Dutilleux, A. (1881). *Recherches sur les voies anciennes dans le département de Seine-et-Oise*. Versailles: Cerf.

Duval, P.-M. (1961). *Paris antique: des origines au troisième siècle*. Paris: Hermann.

Ellis, J. B., Chocat, B., Fujita, S., Marsalek, J., Rauch W. (Eds.). (2004). *Urban Drainage: A Multilingual Glossary*. London: IWA Publishing.

Ferdière, A., Cribellier, C. (Eds.). (2012). *Agglomérations secondaires antiques en région Centre. Volume 2: actes de la Table ronde d'Orléans, 18-19 novembre 2004*. Tours: Fédération pour l'édition de la revue archéologique du Centre de la France.

Fichtl, S. (2006). Murus et pomerium: réflexions sur la fonction des remparts protohistoriques. *Revue archéologique du Centre de la France*, 44, 55–72.

Gendron, S. (2006). La toponymie des voies romaines et médiévales: les mots des routes anciennes. Paris: Éditions Errance.

Goudineau, C. (2002). Les mystères de la Lieue gauloise. In: L. Rivet, M. Sciallano (Eds.), *Vivre, produire et échanger: reflets méditerranéens: mélanges offerts à Bernard Liou (473–478)*. Montagnac: M. Mergoil.

Guérineau de Boisvilllette, L.-G., Impr. de Hébert. (1861). *Itinéraire du pays carnute*. Publication de la Société archéologique d'Eure-et-Loir. Chartres: Impr de Hébert. <http://gallica.bnf.fr/ark:/12148/btv1b8444104d> (28.01.2016).

Hyginus Gromaticus, Frontin, Siculus Flaccus, Hyginus mensor, Balbus, Agennius Urbicus, Thulin C. O. (Ed.). (1971). *Corpus Agrimensorum Romanorum*. Vol. I, fasc. 1, *Opuscula Agrimensorum veterum*. Stuttgart: B. G Teubner.

Jalmain, D., (1972). Étude des voies romaines entre Seine et Loire. In: *Colloque international sur la cartographie archéologique et historique* (Ed.), *Colloque international sur la cartographie archéologique et historique: à la mémoire du R.P.F. Oudot de Dainville*. Tours: Centre de recherches A. Piganiol 1972. (pp. 111–114).

Joly, D. (2013). De la fouille urbaine à l'archéologie de la ville: le cas de Chartres. In: E. Lorans, X. Rodier (Eds.), *Archéologie de l'espace urbain*. (pp. 316–328). Tours: Presses universitaires François Rabelais.

Joly, D., Gibut, P. (2009). La place de l'âge du Fer dans l'archéologie urbaine à Chartres (Eure-et-Loir). In: *L'âge du fer dans la boucle de la Loire; les Gaulois sont dans la ville: actes du XXXIIe colloque de l'Association Française pour l'Etude de l'Age du Fer*, 1er-4 mai 2008, Bourges, France. Paris: Fédération pour l'édition de la revue archéologique du Centre de la France 2009, (pp. 317–328).

Jordanes. Devillers O. (Ed.). (2000). *Histoire des Goths*. Paris: Les Belles Lettres.

Joyeux, P., Josset, D., Canni, D., Jesset, S., Massat, T., et al. (2016). Orléans du Haut-Empire à l'Antiquité tardive: limites de la ville et franges urbaines. In: C. Besson, O. Blin, B. Triboulot (Eds.), *Franges urbaines et confins territoriaux. La Gaule dans l'Empire : actes du colloque de Versailles, 29 février-3 mars 2012*. Bordeaux: Ausionius ( pp. 109–136).

Leturcq, S. (1997). La route et le paysage: dynamique et stabilité des réseaux routiers beaucerons entre Etampes et la forêt d'Orléans. In: G. Chouquer (Ed.), *Les formes des paysages. 3, L'analyse des systèmes spatiaux*., (pp. 78–87). Paris: Éditions Errance.

Marchand, C. (2009). Analyse morphologique dynamique des réseaux de voies. *Les nouvelles de l'archéologie*, 115, 18–23. doi:10.4000/nda.646.

Merlet, L. (1870). Voies Orléans-Chartres. In: *Congrès scientifique de France*, 36, 1869, Chartres. (pp. 388–389). Chartres: impr. de Garnier 1870.

Naudet, F., Provost, M. (Ed.). (2004). *Essone. Carte archéologique de la Gaule 91*. Paris: Académie des Inscriptions et Belles-Lettres.

Ollagnier, A., Joly, D., Provost, M. (Ed.). (1994). *L'Eure-et-Loir. Carte archéologique de la Gaule 28*. Paris: Académie des inscriptions et belles-lettres.

Oulmont, P. (2002). *L'Essonne traversée: des voies romaines aux voies rapides*. Evry: CDDP 91.

Peek, J. (1975). *Inventaire des mégalithes de la France*: Paris, Yvelines, Essonne, Hauts-de-Seine, Seine-Saint-Denis, Val-de-Marne, Val-d'Oise. *Gallia préhistoire 1er supplément*. Paris: Éditions du Centre national de la recherche scientifique.

Portet, P. (Ed.). (2004). *Bertrand Boyset, la vie et les œuvres techniques d'un arpenteur médiéval (v.1355 - v.1416)*: éd. et commentaire du texte provençal de "La siensa de destrar" et de "La siensa d'atermenar". Paris: Éditions Le Manuscrit.

Risch, L. (1935). En suivant la voie romaine de Paris à Orléans. *Bulletin de la Commission des antiquités et des arts / Département de Seine-et-Oise*, XLVII, 204–213.

Robert, S. (2003). Comment les formes du passé se transmettent-elles ?. In: *Objets en crise, objets recomposés* (pp. 115–132), Paris: Ed de l'École des hautes études en sciences sociales, 2003.

Robert, S. (Ed.). (2011). *Sources et techniques de l'archéogéographie*. Besançon: Presses universitaires de Franche-Comté.

Roblin, M. (1951). Cités ou citadelles ? Les enceintes romaines du Bas-Empire d'après l'exemple de Paris. *Revue des Études Anciennes* 53(3). 301–311. doi:10.3406/re.1951.3457.

Roblin, M. (1971). Le terroir de Paris aux époques gallo-romaine et franque: peuplement et défrichement dans la Civitas des Parisii (Seine, Seine-et-Oise). Paris: A. et J. Picard.

Soyer, J. (1971). Les voies antiques de l'Orléanais: civitas Aurelianorum. *Mémoires de La Société Archéologique et Historique de l'Orléanais, Hors Série*. Orléans: Société archéologique et historique de l'Orléanais. <http://gallica.bnf.fr/ark:/12148/bpt6k65696747/03.02.2016>.

Surmely, F. (2012). Programme de recherches sur les menhirs d'Auvergne: premiers résultats. In: T. Perrin, I. Sénépart, J. Cauliez (Eds.), *Dynamismes et rythmes évolutifs des sociétés de la Préhistoire récente: actualité de la recherche*. (pp. 307–319). Toulouse: Archives d'écologie préhistorique.

Vilpoux, J. (1998). Orléans, Loiret, Centre. *Illustration 1997-CE-0263-01, La ville du Haut-Empire de part et d'autre de la Loire (notice)*. In: *Gallia informations 1997, l'Archéologie des régions: Centre (1985-1991), Midi-Pyrénées (1988-1991), Nord - Pas-de-Calais (1983-1997)*. (CD-Rom). Paris: CNRS Editions.

Vion, E. (1989). L'analyse archéologique des réseaux routiers: une rupture méthodologique, des réponses nouvelles. In: *Histoire, géographie et archéologie du territoire en Suisse romande*. (pp. 67–99). Lausanne: Groupe romand d'études d'archéologie du territoire.

Watteaux, M. (2010). La grille rhomboïdale: une méthode d'analyse des trames routières. In: *Formes du foncier*. <http://www.formesdufoncier.org/pdfs/rhomboidale.pdf> (31.01.2017).

Wirth, G., Cuntz O. (1929). *Itineraria Antonini Augusti et Burdigalense. Itineraria Romana 1*. Leipzig: in aedibus B. G. Teubneri.