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ACOUSTIC POTTERY IN MEDIEVAL AND MODERN CHURCHES AND TEMPLES IN EUROPE: THE STATE OF THE KNOWLEDGE

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Abstract

The purpose of this paper is to present some studies on acoustic potteries includes in walls and vaults at medieval and modern times. The majority of authors consider that this research is very difficult because of its multidisciplinary character. In France, a multidisciplinary team worked almost 8 years on this subject. From this experience, an assessment of the listed potteries is carried out in France and in some country of Europe. Some French historical texts in relation with the insertion of the potteries in the walls have been studied. Finally, a not-exhaustive list of recent acoustic studies in Europe is given with their principal results.

Keywords

Acoustic potteries, historical texts, archaeology of building

1. Introduction

The objective of this paper is to present the studies known to date concerning the acoustic vases and to give a progress report on the results obtained by the authors. In section 2, the state of the census of the acoustic potteries will be carried out, in France and Europe. In section 3, we will quote, for the Francophone field, the various written sources dating from the installation of the potteries. In section 4, a point will be made on the acoustic studies known as well as the principal results obtained by the authors. During the conference, the presentation will be of short duration what will leave more time for the questions and comments.

2. Census of potteries

If one finds potteries in the whole of Europe, our census reveals a very important dispersion that it is in France (fig. 1) or Europe (fig. 2) [1]. Currently, we do not know any study which would have been interested in the propagation of the technique in Europe even if it is regarded as coming from the Near East.

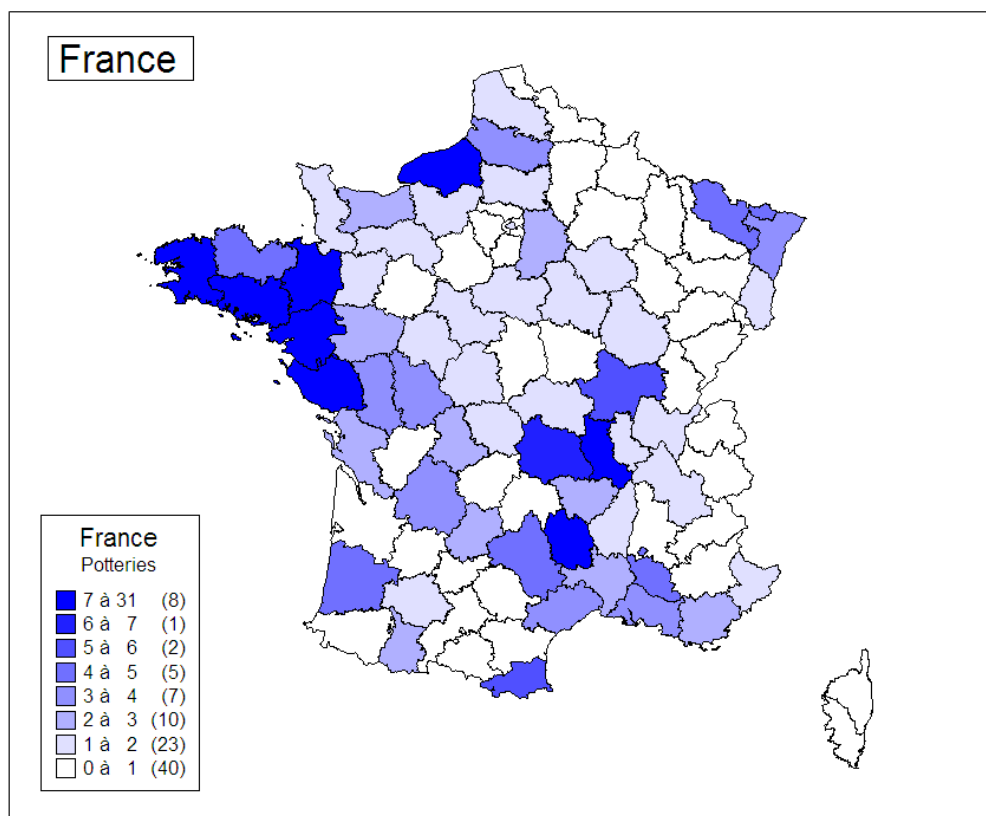


Figure 1 – Census of potteries in France

However the studies are not exhaustive. In France for example, it is difficult to know if one finds more potteries in certain areas, because :

- The technique had more success
- The wars were less destructive
- The “restorations” were less intrusive
- The installation of acoustic pots came later.

This last point seems to be the case of Brittany whose churches which have acoustic pots are generally of XVIth century.

This same phenomenon could be similar everywhere in Europe. Only, a fine analyse of Europe at the regional scale could reveal a realistic image of the situation thanks to the local scholars and national archaeologists.

Another bias is that potteries are found out only if they are sought. The example of France is also convincing on this subject. The studies of Brother Floriot [2] in the Fifties and Sixties allowed the exhumation of many buildings in the Rhône valley and in Provence. At the beginning of the twentieth century, local scholars, such as the abbot Cochet in Normandy [3], Baudoin in the Vendée, Pays de la Loire and Poitou [4] or later Castel in Bretany [5] collected much data in their regions. Thus authorities and population were more sensitized and avoid to destroy the potteries at the time of restoration of their church.

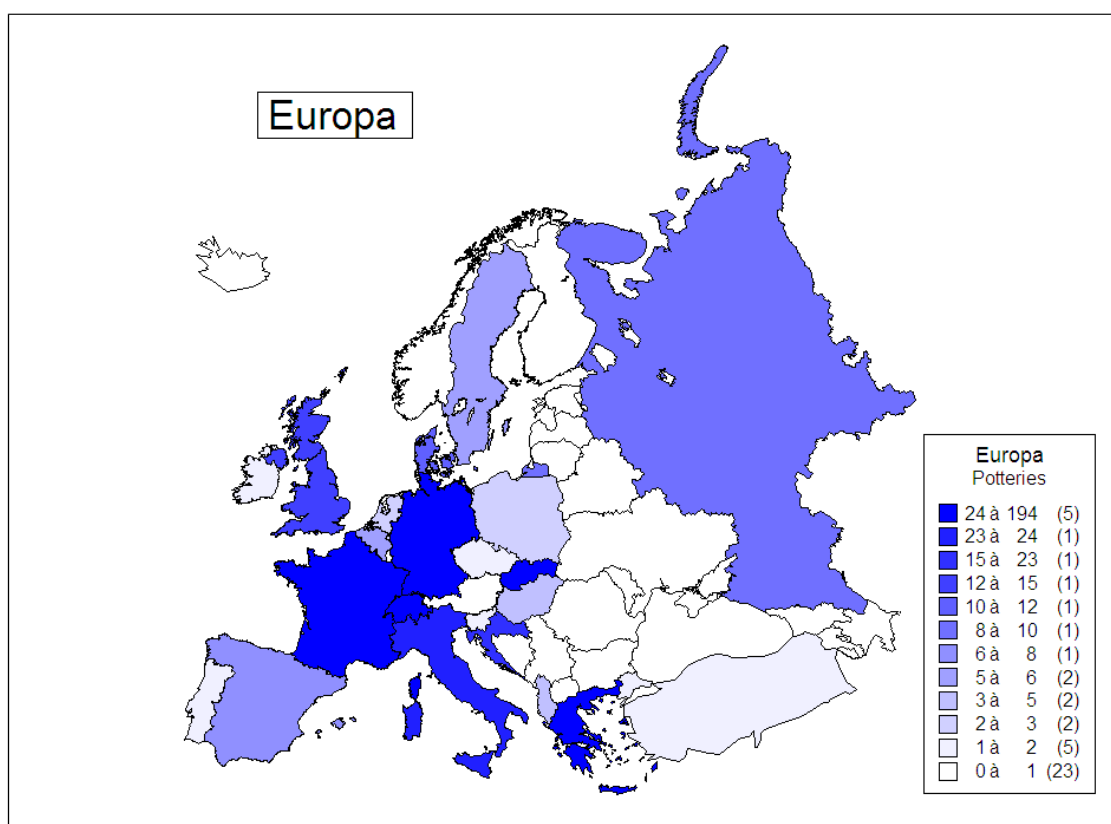


Figure 2 – Census of potteries in Europe

Thus during our research on the French territory, we are doing a sort of “proselytism” in order to sensitize the local authorities, the archaeological services from the state and from the regions so that they pay attention to maintain the vases in state. An example comes from Brittany where copies will be inserted instead of missings or broken potteries during a church restoration.

3. Historical texts

Another important research concern the written sources at the time of the vases. Archaeologists, medieval historians and linguists proved the real acoustical intention of monks and church builders, thanks to analyse of texts.

A chronicle of “Célestins de Metz” monastery in 1432 [6] stated : « [il] *fit et ordonoit de mettre les pots au cuer, portant qu’il avait vu altepart en aucune église et pensant qu’il y fesoit milleur chanter et que il ly resonneroit plus fort* »¹.

A second text from 1616 about the count book of the chapter in « Saint Denis de Vergy » [7] stated : « *Payé 24 sols au tuginier de Belon pour trois douzaines de petits pots pour mettre dans la muraille du chœur, propres à faire résonner la voix* »². Researchers found more than ten texts (at least in France) over the centuries which explicitly mentioned a probable acoustic role of potteries [8].

Few contemporary texts were found but all of them attest the acoustic use of the device. This observation is important, if one refers to the sharp discussions of the scholars and the scientists of XIXth and XXth centuries, about the interpretation of the first potteries discovered in masonries.

The texts of the first acoustics experts like Kircher [9] in Germany or Mersenne [10] in France are also very interesting. For example, “*C’est pour cette raison que l’on met des pots à moineau, ou d’autres vases creux dans les voûtes, ou sur les voûtes des églises, afin d’aider les voix des ceux qui chantent...*”³.

In medieval architecture textbooks, as Alberti [11] or Philibert de l’Orme [12], which evoked concepts of acoustic (often coming from antiquity), there is not (or few) words about the potteries. In 1749, the architect Solomon [13] had to rebuild a ruined church of the Dominican convent of Strasbourg. He provided this comment on the localization of the potteries: “*En démolissant les murs du grand choeur du temple-Neuf (commencé en 1307, achevé en 1345), j’ai trouvé autour des ogives des fenêtres et noyés dans la maçonnerie des pots en terre cuite, l’orifice étant à fleur du mur vers l’intérieur. J’ai réussi à en sortir quelque uns intacts. Ces pots sont en terre grise.... Il y a longtemps qu’on a dû renoncer à croire à l’efficacité de ces pots pour l’acoustique, car tous les orifices étaient bouchés et le crépis les recouvraient complètement*⁴. *Autour de chaque ogive se trouvaient neuf pots, l’un au sommet et quatre de chaque côté.(....) Apparemment que ces pots servoient à augmenter le ton des voix lorsque les Religieux chantoient au choeur* ».

4. Known acoustic studies

For a long time, this subject was covered only by archaeologists and by local scholars interested by devices present in their city or region. In the Fifties and Sixties, with the development of acoustics and especially of the means of measurements and recordings of the sounds, this devices have been scientifically studied: V. Bruel in Denmark

¹ “He ordered to put the pots in the choir, arguing he had seen elsewhere in other church and thinking that the song was better and stronger resonant “

² “Paid 24 sols at the potter of « Belon » for three dozens of small pots to be inserted in the wall of the choir, in order to better make resound the voice”

³ “For this reason one puts sparrow pots or other hollow vases in the vaults, or on the vaults of the churches, in order to help the voices of those which sing...”

⁴ ... A long time ago that one had to give up accepting the effectiveness of these pots for acoustics, because all the openings were stopped and the roughcast recovered them completely....

(1947) [14], R. Floriot, in France, in 1964 [2], I. Koumanoudis, in Greece, in 1967, [15], J.-M. Fontaine in France in 1979 [16].

These last ten years, different studies were performed within Europe as well by archeologists than acousticians: A. Kottmann in Germany [17], V. Desarnaulds in Switzerland [18-20], Mijic M and Sumarac-Pavlovic, in Serbia [21], A. Boato in Italy [22], T. Zakinthinos and D. Skarlatos in Greece [23] and a consortium of researcher in France coordinated by ourselves [1].

Table 1 – Some experimental and numerical studies (not exhaustive)

	<i>Authors</i>	<i>Principal results</i>
Experiment In situ in real church	Fontaine (1979)	Amplification and decrease of reverberation time
Experiment in situ by reconstitution	Floriot (1964), Zakinthinos and D; Skarloto (2006)	Decrease of reverberation time
Experiment in laboratory	Floriot (1964), Desarnaults (2002)	Decrease of reverberation time, transient regularisation, diminution of focalisation and stationary wave
Numerical simulation	Kottman (Dreager consulting) (2008)	Decrease of reverberation time
Pottery measurements	Floriot (1964), Valiere & al. (2006-2009), Pollack (2011), Mijic (2004)	Problem of the choice of the potteries. Characterisation of potteries

5. Conclusion

A short review of the results and studies on the different fields concerning acoustic potteries are presented, from France then extended to Europe. If this phenomenon is very widespread, it seems very disparate from one country to another. Nevertheless, this dispersion is probably as much the testimony of the history of the country or the lack of research carried out as the reality of the medieval situation.

Thus, final conclusions are still difficult to establish starting from the undertaken studies. Nevertheless, now the majority of authors are finally convinced that at least the acoustic intention was quite present at the time of this devices installation. Also, unquestionable regularities of the resonance frequency testify that the builders knew the empirical rules of acoustic potteries.

These last years of research also convinced us that it would be useful if medievalists specialized in the symbolic system could also join their efforts because this dimension seems to be neglected.

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