Impossible Engineering: Technology and Territoriality on the Canal du Midi

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Chandra Mukerji offers us an important book on the design and construction of the Canal du Midi, called Canal royal du Languedoc during the French Ancient Regime. This outstanding canal was constructed during the Louis XIV reign, in parallel to Versailles, at the time was both the largest civil engineering work and the biggest canal ever built in the Western world.

Mukerji’s book is important for a series of reasons. First, it has all the qualities to be a reference text in English about the Canal du Midi, possibly the most important since From Sea to Sea by L.T.C. Rolt.(1) The famous British historian launched the rediscovery of this vitally important development in canal history and hydraulic territorial management. In parallel, various academic studies emerged in France dealing with a range of issues related to the history of canal in different fields: territorial policy, technical description of works, the genius of Riquet, financial dimensions, history of uses, etc. The synthesis overview of what we can call the classical history of the canal culminated in its addition to UNESCO’s World Heritage List in 1996.

Mukerji’s book is also important because it opens a new field for the Canal du Midi studies. She proposes a critical history of the main classical views of the canal design and construction, through a re-examination of some important earlier assessments by key Enlightenment authors like the engineer Belidor and the scientist and astronomer Lalande. A bit curiously Mukerji does not mention relevant recent works by a number of French authors, such those by as Mireille Oblin-Brière (2) on the political role of the Catholic Church in making canal decisions or Michel Cotte (3) on the context of design and construction and the myth of Riquet, or reference authorities on the rural and economic history of Languedoc like Le Roy Ladurie.(4)

This book also presents an important essay in the field of the historical sociology by way of a well documented case study containing some notable historical discoveries and a reinterpretation of apparently well known historical materials. She also deals lengthily with concepts like ‘invisible power’ and ‘epistemic authority’. But what is perhaps the most significant contribution of Mukerji’s book is her application of the concepts of ‘distributed reasoning’ and ‘collective intelligence’ in her approach to the study of the Canal as an ‘impossible engineering’ situation (in terms of the available technology of the time).
The book is divided in nine chapters of equal size, and contains solid historical documentation complemented by attractive photos by the author. However, the lack of pedagogic modern maps makes it almost impossible to understand in geographical terms the history and events surrounding the canal’s development.

In her introductory chapter, Mukerji starts with presentation of her main perspectives. The canal project submitted by Riquet in 1664 to Colbert appears as an exceptional opportunity to develop the king’s power in Languedoc and to implement the royal dream of a new Rome. The Canal is presented ‘as a silent demonstration of disciplinary power over the earth […] and its creatures’ (p. 2). Riquet was at that time a salt taxes collector in Languedoc – neither a real member of the noble class making political decisions nor a civil engineer in the classical sense. The author intends to reexamine the social forces that actually designed and built the canal, and she proposes to apply the concept of distributed cognition and reasoning following Hutchin’s theory to interpret the implications of the eventual success of the canal construction.

Chapter two is devoted to ‘territorial politics’ (p. 15). The decision to try to link the Mediterranean Sea to the Atlantic Ocean by the canal, even it was almost an incredible challenge, took place in the European geopolitical context of the second half of the 17th century, dominated by the confrontation between the French kingdom and the Hapsburg Empire which surrounded it and threatened its territorial and commercial security. Mukerji mainly tackles the internal dimensions of French policy under the stewardship of then minister Colbert as manifested through the canal project and construction (colbertisme). His main goals were to promote peacefully but firmly the central power of Louis XIV in Languedoc and to control the aristocratic centrifugal forces in this insubordinate region of southern France.

In practical terms this policy sought a balance between two opposing features: the ownership of land by regional nobility and the modern vision of what could be good management (mesnagement) of countryside, aiming at an increase in the collective welfare. Through the territorial dimension of the canal, Colbert transformed this land management policy into a tool of control and government, exerting its impersonal power upon the earth and its inhabitants. Mukerji also examines in detail the general and psychological aspects of the ‘patron – client’ relationship of between Riquet and Colbert, the central duo of the project.

During the years 1664–6, the examination of the project both by Colbert and by the regional States of Languedoc raised the question of the credibility of the civil engineering program and of the competence of Riquet’s staff. For instance, the credibility of such a large territorial infrastructure project depended first on the scientific and practical mastery of cartography. But there were three different communities at that time: military engineers, academic geographers and civil surveyors. Mukerji comprehensively explains that such a historical situation simultaneously posed the problem of credibility in the eyes of classical elites and an opportunity, through cooperation, to build a new territorial intelligence using complementary skills. The framework to overcome the ‘impossible engineering’ problem had been settled.

Nevertheless, it seems to the author that the knowledge of classical engineering and hydraulics at that time were not consistent enough to really give the capacity to design and undertake the canal. This framework for credibility is analyzed and developed in terms of its different issues in chapter three, ‘Epistemic credibility’ (p. 36). In particular, the author pays a great deal of attention to Riquet’s individual competency in the context of his social status at the intersection of the bourgeoisie and lower noble class (petite noblesse), which joined to his lack of engineering education provides for Mukerji a major doubt as regards Riquet’s credibility. This is probably excessive because his noble status and relations with regional elites and central power are underestimated. Situation of French nobility was complex and moving at that time, and Riquet had a key role among the powerful financial network of king tax collectors.

Between 1664 and 1666 Riquet lobbied to reactive the ancient and idealistic project for a canal between the Aude River and the Garonne River, as the key to an inland waterway system linking the Mediterranean Sea and the Atlantic Ocean. Its main idea relied upon the control and management of the abundant waters going
down from the Montagne Noire by the use of a series of small rivers close from the continental divide line. He studied the hydrography and topography of Montagne Noire with the help of Campmas, the master of water (maître fontainier) from the nearby city of Revel. This offers a good example of the important role of artisans with a deep understanding of local conditions. Riquet himself made some experiments using scale models of locks and water management devices in his property of Bonrepos. Other collaborations are portrayed: with the engineer and cartographer Andreossy; the mix commission established by both Colbert and States of Languedoc; the active cooperation for the line design of the canal with Boutheroue, one of the contractors of Canal de Briare, the first ever Western summit-level canal built around twenty years before; with de Clerville a military engineer sent by Colbert as supervisor of the canal and redactor of the official quotation.

Chapter four, ‘New Rome confronts Old Gaul’ (p. 60), mainly presents the initial steps of construction from the Royal Authorization Act of 1666 to the end of the ‘first enterprise’ of the canal. These were the water supply system, the western canal branch from Naurouze to Toulouse and the Garonne River, and a part of the eastern branch to the city of Trèbes on the Aude River. Authorization was gained after the Riquet’s successful experiment proved, using a small supply canal, that water could flow from the base of Montagne Noire to the Naurouze Pass. Mukerji underlines the difficulties in choosing accurately the thread of the canal. These were reinforced by the apparent great hesitation in deciding where the canal must go and by which ways. She also emphasizes the social and political difficulties Riquet’s enterprise faced in Toulouse City. ‘Old Gaul’ means for Mukerji the ancient aristocratic elite from Languedoc, opposed to the royal canal project, and especially angry about Riquet’s capability and his role as a visible symbol of Parisian malice. Riquet’s inadequacy seemed to be demonstrated by the failure of the first lock in Toulouse, which made it necessary to build an entirely new model for success. To overcome its numerous difficulties, the enterprise could not count upon engineering calculations, which were not sufficiently developed at that time, but only upon the cooperative process between a large set of different professional groups, with major input coming from local artisans and skilful peasants. It was this improvised cooperative work which made the canal design and construction possible.

‘Shifting Sands’ (p. 91) deepens the New Rome project and researches its epistemic bases and limits through the ‘second enterprise’ (contracted by Riquet in December 1668 but really becoming active as a workplace during the 1670s) and through the Sète port project also contracted by Riquet. The canal enterprise faced a series of new technical challenges, such as whether to choose the line by Narbonne and the sandy and wet lands of the Mediterranean shore or by the hilly countryside of Minervois and city of Beziers. Difficulties also manifested themselves in the form of the shifting sands that foiled the new dike of the Sète harbor. New collaborators like engineer La Feuille or mathematician Mourgues joined the staff. New managerial methods were also implemented, e.g. with more separate workplaces under the responsibility of subcontractors, with better recognition of artisans and peasants capacities, and so on.

Mukerji continues her enquiries with the next chapter, ‘The New Romans’ (p. 117). She analyzes accurately the competencies in construction techniques and hydraulics of the artisans and peasants employed at the canal workplaces, who were the real actors in the construction and even responsible for designing some important canal features. Through distributed and cooperative intelligence they provided solutions which overcame the recurrent weakness stemming from the limited state of the arts of engineering and hydraulics. They had a series of deep and complementary professional skills which played a vital part in completing the project. Mukerji patiently tries to demonstrate that such knowhow and practices came from the Roman period in Languedoc, surviving throughout the centuries as scattered popular knowledge. The laborers are thus the ‘new Romans’ of the chapter title. Building the canal offered an exceptional opportunity to reuse, to agglomerate and to reshape ancient Roman techniques for construction and hydraulics. Mukerji’s paradigmatic example is that of the ‘indigenous women engineers’ coming from the Pyrenean mountainous countries (p. 134–53). The exceptional combination of a matriarchal social structure and an outstanding water management situation in Bigorre county explained the fact that peasant women owned an exceptional hydraulic knowhow, which allowed to help significantly not only in the construction of the canal but also in finding innovative design solutions to some crucial problems: contributing to the Montagne Noire hydraulic
system for supplying the canal; lining the canal in Minervois; and assisting in the construction of the outstanding feature that is the water-staircase of Fonsérannes, made of eight successive locks.

Chapter seven, ‘Thinking like a King’ (p. 154), is devoted to the analysis of Riquet’s social and psychological character, and to his evolution during the canal’s construction. The author again examines the relationship between Colbert and Riquet and its deep deterioration during the end of the 1660s and the 1670s. She also examines how the entrepreneur changed in terms of social position and technical credibility. His hubris seemed to increase exponentially with the progress of the canal construction and he had the feeling that God itself had inspired him, and had given him unique ability and outstanding intelligence in order to construct the canal. In contrast, Mukerji pay little attention to his role as an entrepreneur, merely commenting on ‘the community of practitioners he had so skillfully helped to assemble’ (p. 156). For her, Riquet’s behavior remained mainly that of a new noble attitude which ‘cultivated modern form of power using tools of traditional authority’ (p. 174).

In the next chapter, ‘Monumental Achievement’ (p 176), the author describes the difficult completion of the canal works. Riquet’s autonomous character and his determination to quickly finish the canal led him to choose against general advice to dig the canal to Beziers directly by tunneling the waterway through the Malpas spur. During following months, the canal construction faced the death of Riquet and Colbert and other changes in the main actors, such as the new minister Seignelay and Vauban the famous military engineer. The date of the effective opening of the canal is still a matter of discussion, as important complementary works were needed until 1696. Again Mukerji returns to Riquet’s history, this time to examine his legend under the subtitle ‘Transmuting Lead into Gold’ (p. 182). She examines the social transformation process from the collective creativity of the canal workers to an individual creativity, Riquet’s. This was done deliberately first by the central state and later by the engineers and scientists of Enlightenment such as Belidor and Lalande. Riquet’s image was also recuperated by his former regional detractors in Languedoc as a regional icon of the genius engineer.

In her final chapter, ‘Power of Impersonal Rule’ (p. 203), the author emphasizes her main results, mainly in a conceptual perspective with some insights from the philosophy of science and technology. Her concluding schema (p. 205) presents an interpretative system based on four main radial branches: state territoriality policy and administration, natural knowledge and collective intelligence, material techniques and professional practices, and the principle of improvements such as Colbertisme and New Rome dream. The intersection forms the ‘knot of impersonal rule’. She also gives some insights about the relationship between ‘strategies and logistics’ (p. 215) in the history of the Canal du Midi’s construction.

The Mukerji approach and methodology are in general very well constructed. Without any doubt the author deserves praise for her serious historical and sociological work which reexamines the classical history of the Canal du Midi. Furthermore, she discusses some important dimensions in epistemology and gender studies concerning collective creativity and distributed knowledge. The work is well documented and logically presented, though there are some unnecessary repetitions and some recurrent terms in the text, e.g. the frequent subchapters on Riquet’s character, the use of ‘modern Rome’ as an almost unique explanation (with stewardship) of the philosophical policy of Louis XIV and Colbert.

One limit of this work is perhaps its tendency to fit history to a concept, in order to demonstrate those conclusions that the author thinks important. That leads sometimes to the choice of and emphasis on some facts, and the underestimation of others – consequently some demonstrations remain fragile and not completely convincing. For instance, she is extremely interested by the question of the Roman roots of technology in Languedoc both among peasants, local artisans and military engineers. From the first she asserts that this occurs mainly by the imitation of the Roman heritage present in abundance in the Languedoc landscape. That seems an interesting thesis about origins of vernacular regional know-how, but it could not be considered the sole root. Historically, the use of the Roman heritage as example for construction was of central importance, but mainly during medieval period of the 11th and 12th centuries. Later these patterns had been largely refined and frequently conformed to other architectural trends and constructive methods.
During the Canal period, the main architectural evidence along the Canal was not antique but medieval like the cities of Carcassonne and Beziers, and furthermore Toulouse, with medieval monuments, palaces from Renaissance, modern bridge of Pont Neuf, etc. This outstanding recent workplace had faced similar problems of foundation as met by the canal in Toulouse. In terms of general architecture, the Italian Renaissance certainly influenced the Canal (e.g. in terms of the curved form of the lock walls and the use of the pozzolane hydraulic mortar). The vernacular know-how of the 17th Century didn’t stretch to sophisticated importations but used the natural hydraulic lime present in some Languedoc quarries. For the general lining of the canal especially in Toulouse and Lauragais regions, the capitalization of the Canal de Briare through the effective participation of Boutheroue must be stressed. The lining of the Montagne Noire water supply system is good example of cooperative design and distributed knowledge as proposed by Mukerji, but its long history is largely more complex that she states.

Beyond these remarks, more intended to open a dialogue than as criticism, Mukerji opens a new chapter in the history of the Canal du Midi, aiming to deepen understanding of its design and construction, and also of the related social and gender patterns. Furthermore, this important book also both stresses the concept of distributed knowledge /collective intelligence, and provides a deeper understanding of the impersonal power of structures. Mukeji demonstrates the necessity to pursue studies such as this with an open mind and a critical attitude.

**Notes**


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