

## Studying and explaining the architectural heritage: from digital model to physical models

J.Y. BLAISE, I. DUDEK

introduction by A. NÉROULIDIS

*CNRS-MAP (Models and simulations for architecture and heritage) laboratory is a French research unit (under the authority of the National Centre for Scientific Research and of the Ministry for Culture) investigating scientific and technological issues at the intersection of applied informatics, design processes in architecture, and heritage studies.*

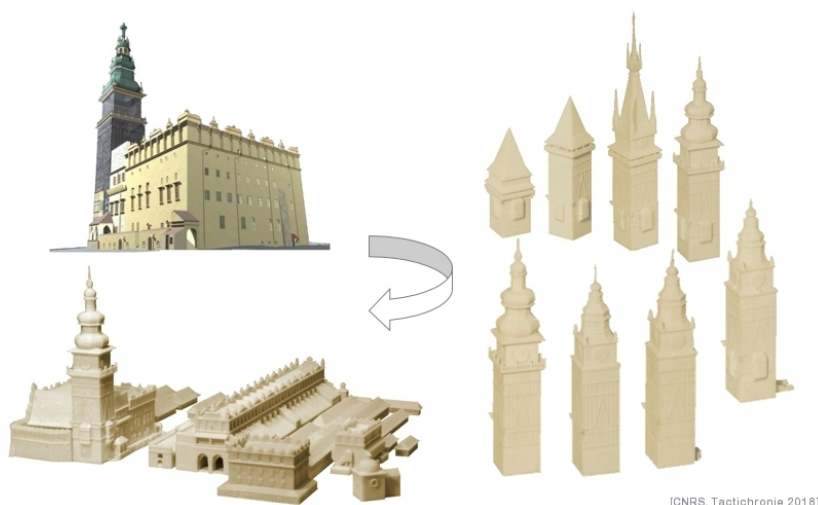
*Two research projects, URBANIA and Tactichronie (tangible chronology) explore ways in which a bridge between physical and digital models can be created and used to make architectural heritage more accessible. This blog post will present Tactichronie and will be followed by another one in the series presenting URBANIA.*

This contribution was published on the [V&A Blog](#) : News, articles and stories from the V&A [Victoria and Albert Museum] - Architectural models Group.  
Posted: June 26, 2018 by [Niamh Bhalla](#)

<<https://www.vam.ac.uk/blog/projects/studying-and-explaining-architectural-heritage-from-digital-to-physical-models-part-1-tangible-chronology>>

### “What can we do with a tangible model that we can’t do with a virtual model?”

This is the question explored in the [Tactichronie project](#), involving a physical model produced with a 3D printer. The resulting a proof-of-concept prototype represents transformations that occurred on Krakow’s Market Square (Poland) over a period of 750 years. The prototype combines a master board, 3D physical models of the artefacts, with a coding of their position on the board and in ordinal time, and a tangible timeline for each artefact.

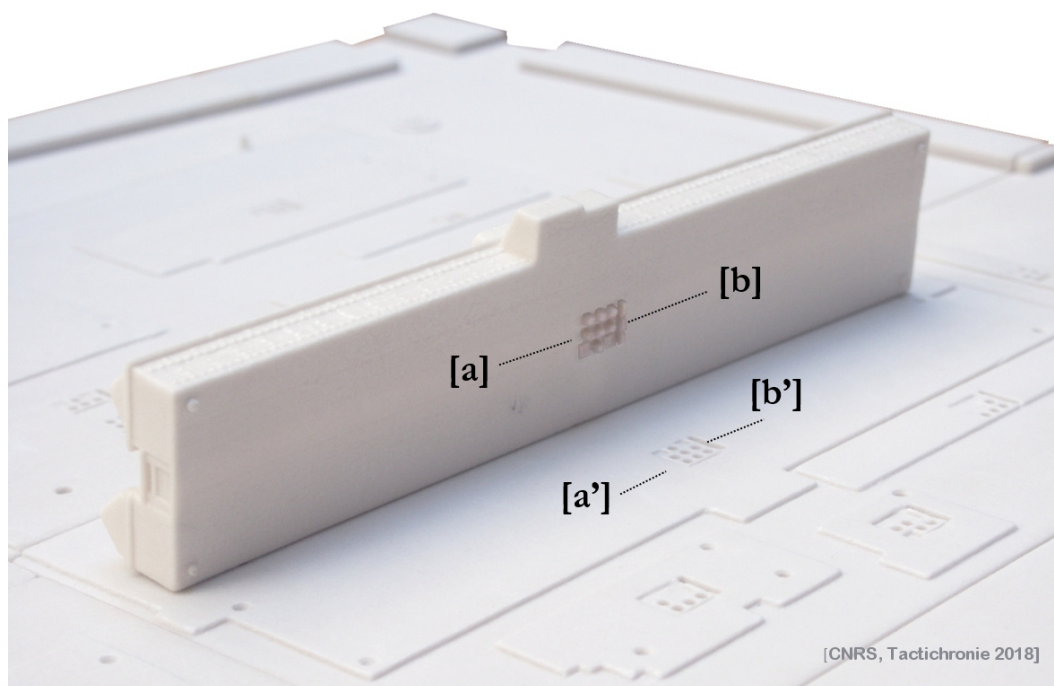


[CNRS, Tactichronie 2018]

**Tangible chronology components: experimenting a move from CAD-based virtual environments to tangibility.**

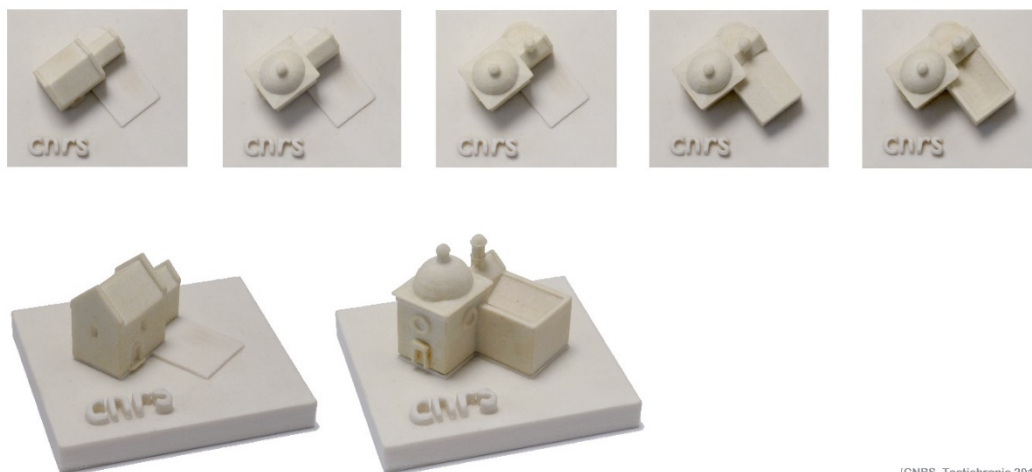
The prototype's role is to represent and help understanding through physical models the process of evolution of an urban space, including non-morphological changes, durations and intervals, and uncertainty (a challenging but important element of the analytical processes in historical research).

Each artefact is localised in space through a univocal and tangible geocode, carved in positive at the bottom of the physical model. The geocode is a simple 3 X 3 grid composed from flat squares and thick cylinders [a], allowing a univocal identification of artefacts (512 combinations). In addition to the grid, the geocode includes a small rectangle [b], that acts as a positioning pin and indicates North at assembly time. For each edifice, a corresponding geocode is carved in negative on the masterboard [a', b'], allowing a univocal and fully tangible assembly.



**Concept and implementation of the geocode.**

For each edifice, there are as many 3D physical models as there are successive (and known) morphological evolutions of the edifice.

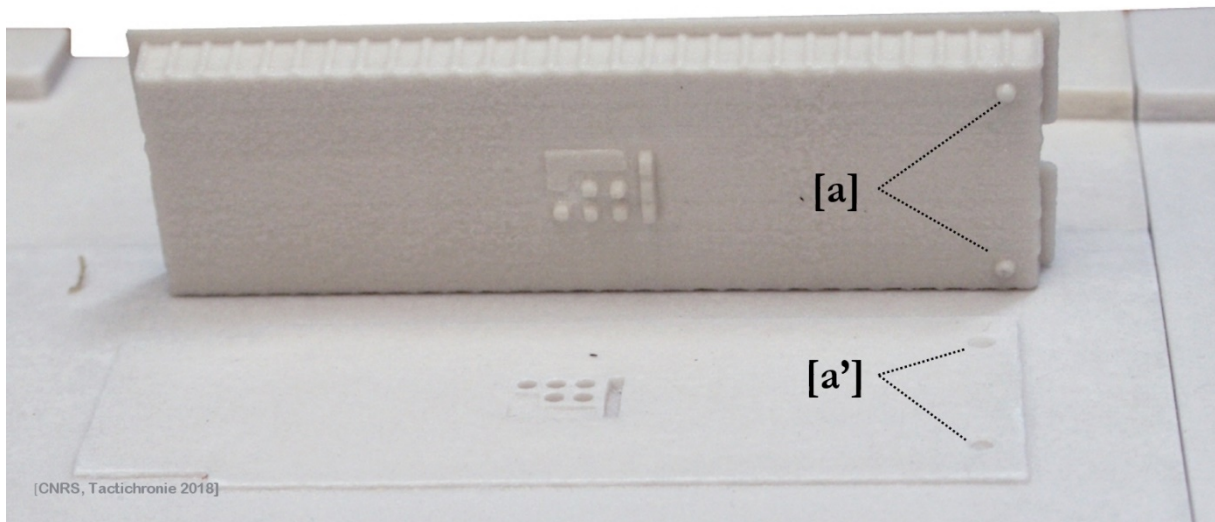




[CNRS, Tactichronie 2018]

***A number of physical models for each edifice.***

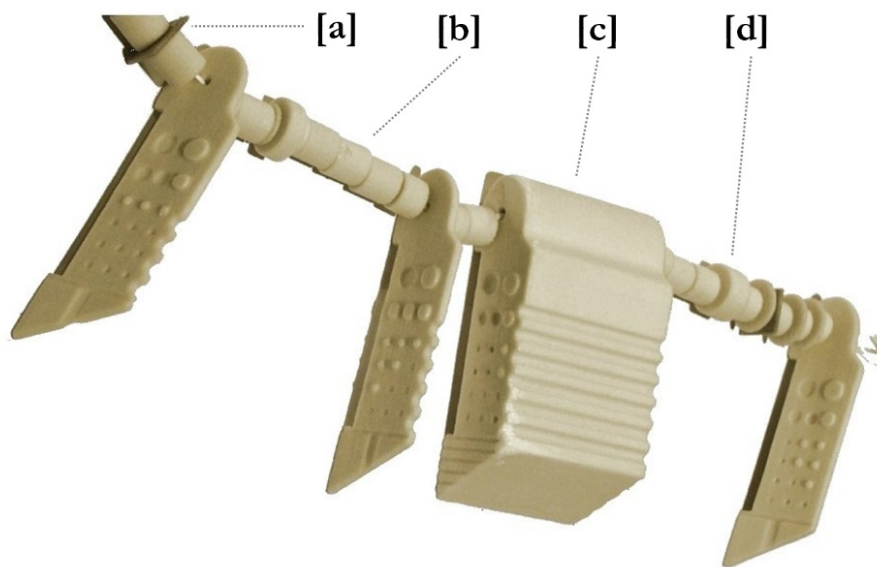
Each group of physical models representing an evolution of particular edifice can be ordered chronologically thanks to ‘ordonators’ (cylindrical pins), a tangible codification carved in positive beneath the physical model [a]. Corresponding slots are carved in negative on the masterboard [a’], allowing users to check at a glance the overall number of known evolutions for each edifice.



***Concept and implementation of the ordonators.***

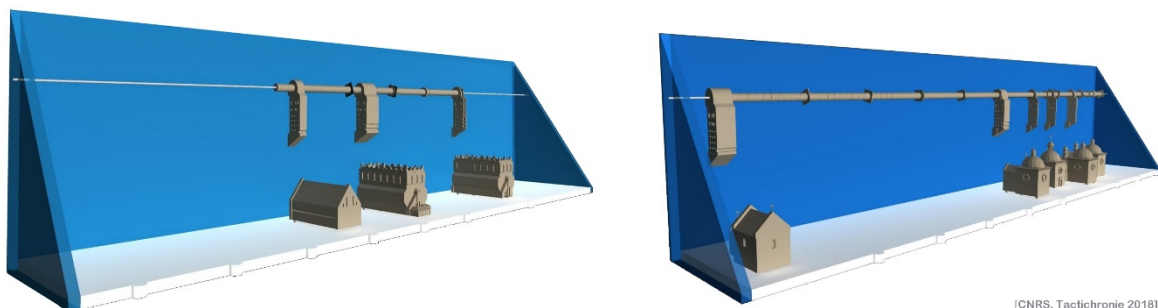
A “tangible timeline” called *chronocorde* features for each edifice tangible codifications of dates, durations, uncertainty in dating, and differentiates functional transformations from morphological transformations.

It is composed (Figure below) of small, cylindrical beads representing time units, square elements [a] disposed at each turn of the century and transformation plates. Regular cylinders [b] represent decades. Thicker ones [d] identify duration of non-morphological transformations (e.g., functional transformation, change of owner). The width of transformation plates [c] represents the duration of the transformation, with an encoding of dates corresponding to the beginning/end of the transformation carved on vertical borders. Uncertainty of the dating (modelled as levels of a lexical scale that runs from “unsourced, hypothetical” information to “confirmed evidence”) is represented physically by various grooves at the tip of the element, and the position in the order of the artefact’s transformations indexed on the top of the plate.



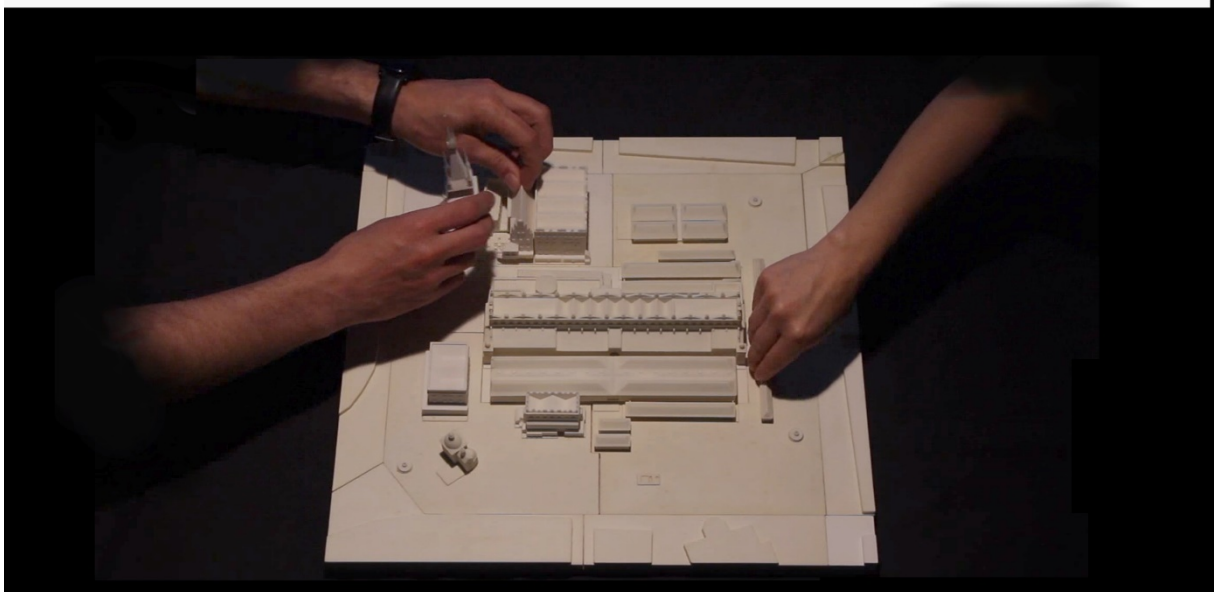
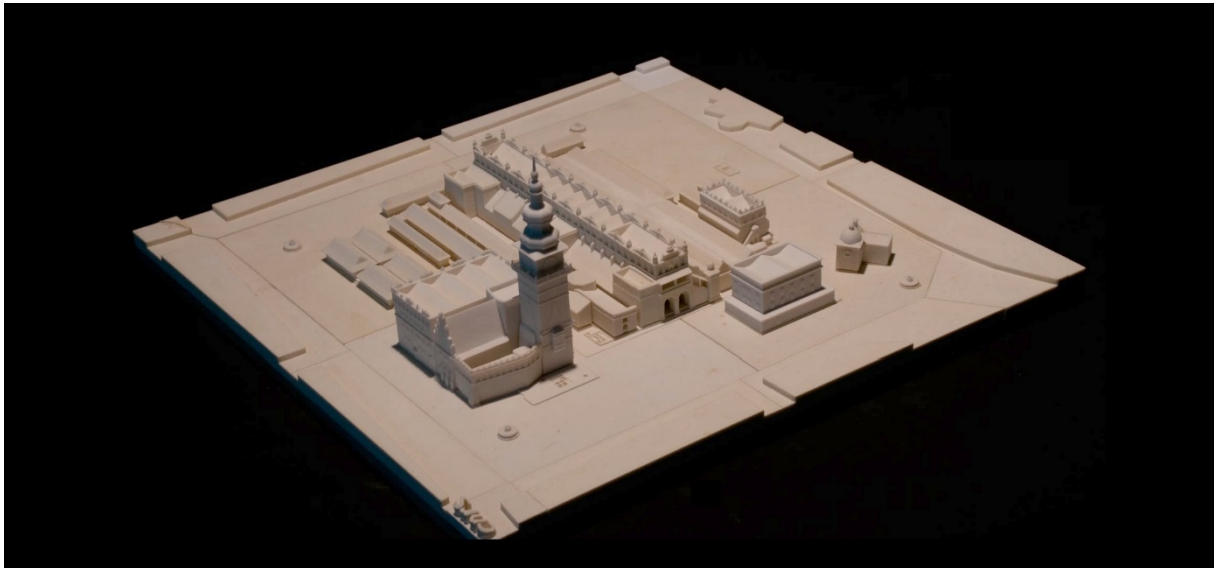
*Chronocordes - basically a tangible equivalent to the concept of timeline*

A *chronocorde* may be used to read the evolution of one specific artefact (Figure below) or to match a given evolution of the object with user-chosen selected dates when combining models on the board.



Initially designed for the blind and ill-seeing people, the prototype was tested with various audiences, patented and extended to match the requirements of edutainment tasks (in the context of museums and/or education).

The tangible chronology experiment demonstrates that consistency of physical models with the underlying data's specificity (temporal aspects, uncertainty) does not undermine scientific communication, it helps it.



*The Tactichronie master board, on which physical models representing “versions” of artefacts can be combined to match any date from 1250 to 2012.*

Iwona Dudek, Jean-Yves Blaise. A Tangible Chronology. Philip Verhagen. *40th annual conference of Computer applications and quantitative methods in archaeology*, Mar 2013, Southampton, United Kingdom. Amsterdam university press, Volume II, pp.874-887, 2013, CAA series Computer applications and quantitative methods in archaeology.