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## Dômes Acoustiques à géométrie variable

David Serero

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## VARIABLE GEOMETRY ACOUSTICAL DOMES

Research and installation at Villa Medici  
2004-2005

Site: Grand Salon, Villa Medici, Rome, Italy

Client: Villa Medici, French Academy in Rome

Size: 160 m<sup>2</sup>(18m long by 9m wide)

Reverberation times: from 0.8 to 5 seconds

Weight: 180 kg

Form control: CNC winches linked to custom software

Cost: 60 000 Euros

Materials: Fiberglass woven fabric of Saint Gobain : FABRASORB® Acoustical Membrane,  
Honeycomb panels of Alcan Composites: Alucore

Cost: 50 000 Euros

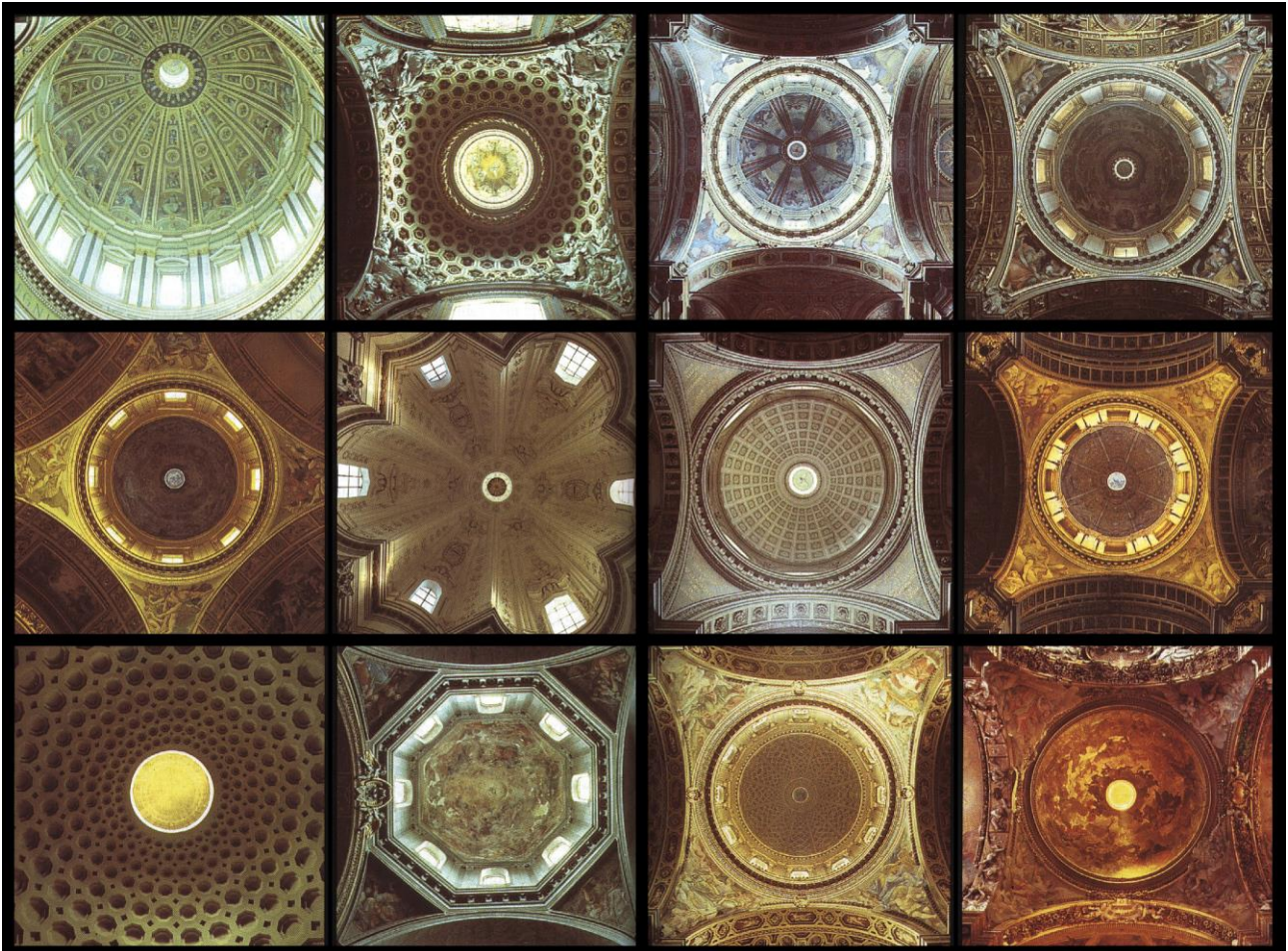
Credits :

Concept and Design: David Serero | ITERAE Architecture

Scripts: Yves Ubelman

Model Engineering: Luca Bernardi

Acoustician : Christina Aureli



With the support of Villa Médicis/Académie de France à Rome

“ The work of Serero Investigates new architectural forms of theatres. His research based on the manipulation of acoustical, topographical, and light fields develops parametric forms, which are the ground for the invention of new forms of theaters in which, space itself maintains an open and flexible relationship with the Artwork, the spectator and its surrounding environment.

The Acoustical Domes of variable geometry emerge from a research on the computation of acoustics and the propagation and reflection of sound in space. Sound, which is both a physical and immaterial phenomenon, is here used as the context of a spatial intervention in a 40 feet high Renaissance Salon at Villa Medici with terrible echoing effect. A surface was deployed in space with a geometry, which allows for its transformation in time and the modification of the acoustical behavior of the space. This device creates a possibility of adjustment of the volume of the room and therefore its reverberation time. This "Dome", like the architectural archetype allows for an interaction between the volume of the room and the propagation of music. "

Started in New York in 2002, this project is a result of the research of David Serero on variable geometries, which can be simulated and CNC controlled. Serero received the Rome Prize for it in 2004 and presented a prototype at the Villa Medici during his residency in Rome.

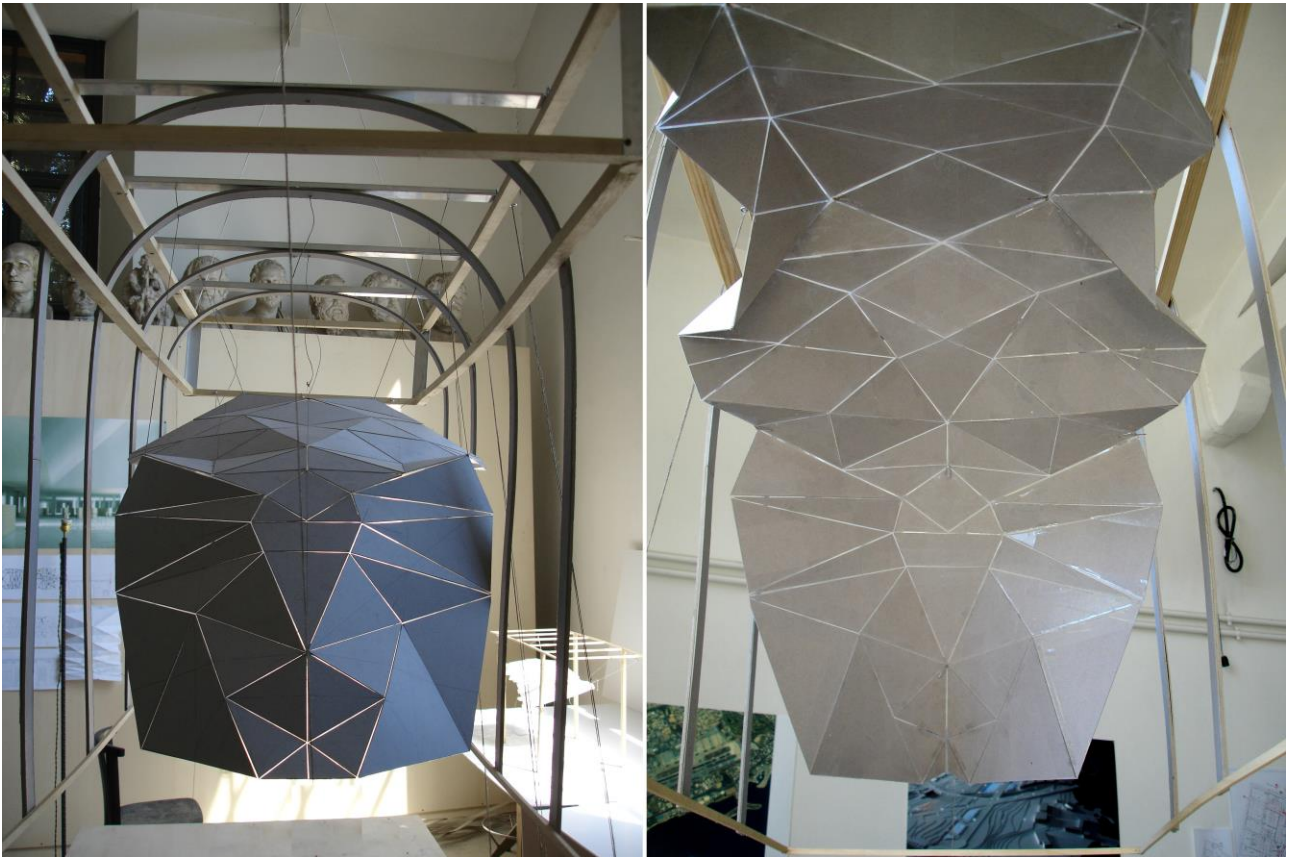
### **Serero's Statement**

"... Traditionally, domes are seen as architectural elements, which allow for the covering of large spaces by accumulation of discrete components. For the last three years I worked on designing and engineering prototypes of a new kind of domes, which does not relate to structure but instead to acoustics. In collaboration with a mathematician, an acoustician and a programmer, I have been developing new ways to simulate acoustical behavior of space and construct sound-fields which are the projective base of these new domes.

Music, both a physical and immaterial phenomenon is here a measuring tool to analyze and draw spaces. Suspended to the ceiling of an existing space, the Acoustical Dome is an experimental device, which geometry allows for a variation of position in space and an adjustment of form to modify the acoustical behavior of the hall.

Here, space is not passive to music; it proceeds on an interactive mode where musical composition is imprinted in a form and where the room's geometry can be modified for each performance, for each public, in real time. It is the type of event, a music concert, a lecture, a song, which inflects the computation, which folds and unfolds the acoustical dome under the vault of this space. The surface's tessellation and its increasing subdivision affect the number of folds and trigger a reconfiguration of the fields of reverberation and reflection of sound. The form of the Acoustical Dome is generated from both, a digital model of simulation of sound patterns and an analog model of foldable composite panels.

This project defines architectural form not in a final state, but rather as an ephemeral and variable condition, where the possibility of its transformation is inscribed inside of its geometry. Integrating ornamental patterns with acoustical form, the Acoustical Dome allows for an interaction between volume of a room and music propagation in space. The Dome maintains therefore an open and flexible relationship between music, the spectator and its surrounding environment. "



## BIOGRAPHY

David Serero (born 1974, Grenoble, France) received an Architecture Degree from Ecole d'Architecture Paris-Villemin in 1998 and a Master of Architecture from Columbia University. Since 2000, Serero develops in New York and in Paris, projects combining research and design in the fields of architecture, landscape design and urban planning. With a particular interest in generative design, digital manufacturing, fluid dynamics, crystallography, acoustics, genetics and topographical manipulation, his work by weaving connections between these fields and architectural practice attempts to explore new and multiples paths for architectural design.

In 2004, he won the first prize in the International Competition for the Hellenikon Metropolitan Park in Athens, Greece. The project, on the 530 hectares site of the former International Airport of Athens uses computational simulation of water drainage systems and patterns at territorial and local scale to generate a sets of "Softscapes". In 2003, he receives the commission of the the "Art Arena", an Art film museum in London to host 45 projection spaces for the Roland Collection. In 2005, Serero received the Villa Médicis award for a research fellowship at the French Academy in Rome, where he developed the concept of "Variable Configuration Acoustical Domes", a research on ephemeral and parasitic domes, which can dynamically adjust their shapes to modify acoustical behavior and performance of a space.

His work has been widely published and exhibited in shows at the Museum of Modern Art (MOMA), at the Architectural League of New York, the Venice Biennale, and the Mori Museum in Tokyo. Serero taught architectural design studios and Workshops in the USA, in France, in Italy and in Austria.



