

**Studio Anne Holtrop**

**ETH Zürich**

**seminar week**

**FS19**

**MATERIAL GESTURE:**

**GYPSUM**

**March 18–22, 2019**

**Bologna**

**Vicenza**

**Possagno**

**Venezia**

**Zurich**

**Possagno**

**Vicenza**

**Milan**

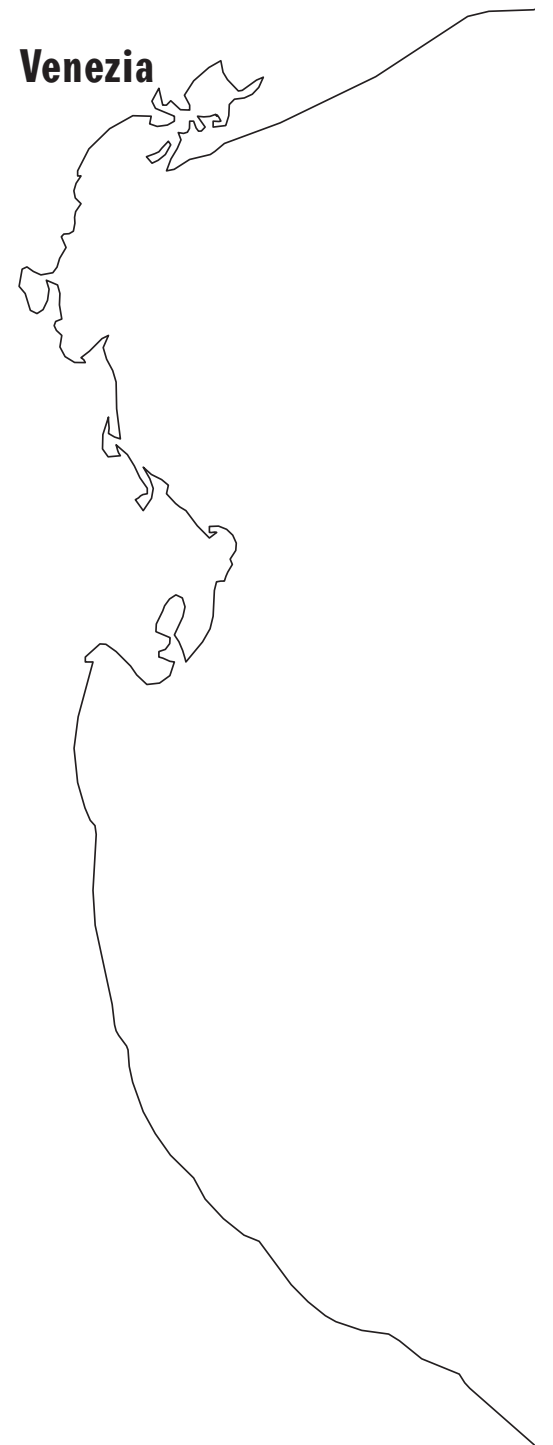
**Nove**

**Venezia**

**Ferrara**

**Bologna**

**Casa Valsenio**





## **SCHEDULE**

### **DAY 1      MON, MAR 18**

**06:10      Train from Zurich HB to Bologna Centrale Station (via Milan)**  
**11:22      Arrival in Bologna Centrale Station and pickup minivans**  
**13:00      Saint-Gobain Gyproc, Quarry and factory, Casola Valsenio**  
**20:00      Dinner and overnight stay in Ferrara**

### **DAY 2      TUE, MAR 19**

**10:30      Fonderia Guastini, Foundry, Gambellara, Vicenza**  
**13:00      Lunch in Vicenza**  
**14:30      Palladio Museum, Vicenza**  
**16:00      Teatro Olimpico, Vicenza**  
**19:00      Dinner and overnight stay in Vicenza**

### **DAY 3      WED, MAR 20**

**09:00      Zannoni Valeriano srls, Ceramic moulds laboratory, Cartigliano**  
**11:00      Ceramiche Rigoni, Ceramics laboratory, Nove, Vicenza**  
**12:30      Lunch**  
**14:00      Italian Art Decoration SRL, Marostica**  
**16:30      Tomba Brion, Altivole (optional)**  
**19:30      Dinner and overnight stay in Bassano del Grappa**

**DAY 4      THU, MAR 21**

**10:00      Gipsoteca Canoviana, Possagno**  
**12:30      Lunch**  
**15:00      Drop down minivans in Venice**  
**15:30      Uni.s.ve., Stucco and scagliola workshops, Venice**  
**19:30      Dinner and overnight stay in Venice**

**DAY 5      FRI, MAR 22**

**09:45      Palazzo Zenobio, Venice**  
**11:00      Scuola Grande dei Carmini, Venice**  
**Palazzo Barbaro, Venice      (waiting for owners availability)**  
**Palazzo Maffetti tiepolo, Venice      (optional but always available)**  
**12:00      Palazzo Albrizzi, Venice**  
**13:30      Lunch in Venice**  
**15:20      Train to Zurich HB**  
**21:50      Arrival in Zurich HB**



**MATERIAL GESTURE:**

**GYPSUM**

**This seminar week is a supplementary component of the design studio, MATERIAL GESTURE, in which we focus on the unique gestures dictated by a material and the specific ways of working with it. We will explore these gestures of making in relation to the material in order to produce an architecture that is solely focused on the relationship between the two.**

**For this first semester, the specific focus will be on GYPSUM, a material which is widely used in architecture and the building industry, either as part of the process of making architecture or as architecture itself, from the mass production of plaster board and gypsum building blocks to the intricate rococo stuccos of the Palazzo Albrizzi in Venice, and the plaster finished interiors of the pyramids. It is also used as a prototyping material for model-making: think of Vincent de Rijk's famous positive and negative**

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**gypsum cast models of the Très Grandes Bibliotheque for OMA, or Christian Kerez' recent Incidental Space research for the Venice Architecture Biennial.**

**On this trip, we will travel to the North of Italy where we will visit several different places of production related to gypsum, from a gypsum mining quarry and production complex to a foundry for bronze casting with gypsum moulds. We will also visit the Palladio Museum, a prototyping and model laboratory, Carlo Scarpa's Gypsoteca Canoviana, a workshop that produces the textile walls cast for Maison Margiela, and historical palazzos in Venice. The trip will end with a workshop on the production process of Venetian stucco and scagliola. Our interest throughout the trip will be related to the physical properties of gypsum, its craftsmanship, specialised fabrication techniques, cultural significance and innovation in the field of architecture. It is a unique opportunity to visit some of these places of production that are not usually open to the public.**





#### **SAINT-GOBAIN GYPROC, QUARRY AND FACTORY, CASOLA VALSENIO**

The quarry in Monte Tondo is a notable example of how gypsum is sourced and how the local natural and cultural environment is modified through the process of material sourcing. The quarry offers the opportunity to observe firsthand the extraction techniques and their effects on the manmade landscape.

#### **DAY 1      MON, MAR 18**

The action of mining is intrinsically entropic, a continual process in which natural elements are undergoing change and gradually moving towards a new equilibrium and into an irreversible condition. With the mining of our building materials, such as gypsum, we change our environment in a very different way with open mining, quarries and its related infrastructure.

In order to build, we mine and therefore we work in parallel on two sides, the sourcing of our material and the construction with it.

## GYPSUM MINING AND PROCESSING

Since gypsum dissolves in water over time, it is rarely found in the form of sand. Most of the world's gypsum is extracted by surface-mining operations. Large quantities of gypsum are found in Brazil, Pakistan, Jamaica, Iran, Thailand, Spain, Germany, Italy, England, Ireland, Canada, and the US. Gypsum rock is mined or quarried, crushed and ground into a fine powder.

No gypsum deposit is 100 percent pure as the raw material is often found in combination with limestone, sand, shale, anhydrite, and sometimes, rock salt. However, a gypsum content of at least 75 percent is necessary for it to be considered commercial-grade gypsum. The quality of the final product depends on the nature and purity of the raw material. Other major parameters are determined by the heating time and temperature as well as the type of grinding. These characteristics define a wide range of materials with very different properties which can be used for very different purposes. In a process called calcination, the powder is heated to 80–150°C, evaporating 75 percent of the chemically combined water, which is released as steam ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O} + \text{heat} \rightarrow \text{CaSO}_4 \cdot 1/2\text{H}_2\text{O} + 3/2\text{H}_2\text{O}$ ). The calcined gypsum, or hemihydrate, becomes the base for gypsum plaster (Plaster of Paris), which does not have strong mechanical properties.

The action is reversible and when dry gypsum powder is mixed with water, it re-forms into gypsum dihydrate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ). This state of gypsum is fast-setting and is employed in mould construction and modelling. The triggering of the phase transition when gypsum reacts with water molecules is a unique property of the material.

If the material is heated over 163°C, it loses all water molecules and forms  $\text{CaSO}_4$ . The material in this state has a longer setting time and is used in the manufacture of gypsum plaster, boards and some other products.

When gypsum is heated to 500–600°C, the chemical composition remains unaltered. However, the material does not react when it comes into contact with water (dead burnt gypsum).

Finally, if gypsum is heated up to 1,000°C, it acquires a very slow setting time. This makes it ideal for use in flooring products which need high mechanical strength and take a longer period to execute.



EXTRACTION OF SOURCE MATERIAL



CRUSHING AND HEATING OF GYPSUM POWDER



PRODUCTION OF GYPSUM BOARD







# **ASSEMBLING OF GYPSUM PREFABRICATED PLASTER BOARDS AND GYPSUM BLOCKS**

The mortar used in the seams is also gypsum-based and the final layer of finishing will be gypsum plaster. The resulting wall is made entirely of gypsum components.





#### **FONDERIA GUASTINI, FOUNDRY, GAMBELLARA, VICENZA**

Many of foundries mainly use the lost-wax technique (cire-perdue), one of the oldest casting techniques in use since the Indus Civilization. The lost-wax method allows the duplication of forms in metals such as bronze, brass, aluminum, silver and gold. It is an antique method but by no means a simple one. The advantages of using gypsum as a mould are multiple: being a porous material, gypsum is insulating. Due to its initial liquid form and its very small particles, it can take any given shape and allows for precise detail. After hardening, the gypsum cast becomes very resistant and rigid. Therefore, it can be used to pour metal at high temperatures. Once the metal solidifies, the cast can be easily removed and reused multiple times.

#### **DAY 2      TUE, MAR 19**

Gypsum plays a crucial role in the work and production of a foundry. It is used to create the moulds in which bronze and other metals are cast.

Unlike in other countries, Italian architecture is characterised by a symphonic combination of many different materials which come together in one building that often appears to be made of just one material – stone.

In this regard, Palladio's work is paradigmatic. Throughout his career, he developed a technical knowledge and a personal language where stone, brick, wood, stucco, and plaster merge into one harmonic whole in a monolithic unity.





**CLAY PROTOTYPE COVERING WITH GYPSUM COAT**  
Once this has hardened, bronze is poured to create the final sculpture.



**TEATRO OLIMPICO, VICENZA, ANDREA PALLADIO, 1580**

The entire theatre is a unitary organism that revolves around the proscenium, which is completely made from gypsum stucco and wood decorations. It references the classical ancient theatre in its configuration but with newly employed materials that recall the classical appearance and gravity of stone.





### DISPLAYED MODELS IN THE PALLADIO MUSEUM

The Palladio Museum shows the genesis and the underlying research behind the major projects of Palladio as well as exposing the complex treatment of very different materials – stone, wood, brick, gypsum, lime – that were brought to a seemingly monomaterial unity in his villas and palazzos. Large scale models and 1:1 mockups are exhibited within the frame of one of Palladio's latest palazzo.



PALLADIO MUSEUM, VICENZA, FACADE, PALAZZO BARBARAN DA PORTO, ANDREA PALLADIO, 1569-70







### **TOMBA BRION, ALTIVOLE, CARLO SCARPA**

**Carlo Scarpa's Tomba Brion is the most delicate and subtle of his projects. The flat ground is sculpted in a sequence of canals, paths, podiums, and basins, and inhabited by fragments of architecture and abstract forms. Concrete walls are eroded and immersed in water, generating the impression of an archeological site flooded with water and full of scattered ruins. Juxtapositions of marble, brass, levigated stucco, glass and steel are encapsulated in the rough concrete surface and are brought together into a harmonious and silent formal unity. Rather than a building, the tomb is a mythical landscape which investigates the erosion of time and accommodates different episodes of a poetic ritual.**

### **DAY 3      WED, MAR 20**

**Gypsum is widely employed in the ceramic industry for decoration and sanitary industrial production. It is used to make the moulds into which the clay is cast (slip casting). When the gypsum mould has absorbed most of the liquid from the outside layer of clay, the remaining slip is poured off for later use. After allowing a period for further absorption of water, the clay-cast piece is shrunk and then removed from the mould. The operation can be repeated multiple times.**

**Gypsum also has applications in the field of architecture and can be itself cast into moulds in combination with other materials to generate small models as well as large architectural elements.**





**ZANNONI VALERIANO SRLS, CERAMIC MOULDS LABORATORY, CARTIGLIANO**  
 This laboratory produces moulds and prototype models in gypsum for ceramic, wax, concrete and resin products, both for the art world as well as large industrial production. Mould modeling is performed either manually or by mechanically milling a gypsum block.

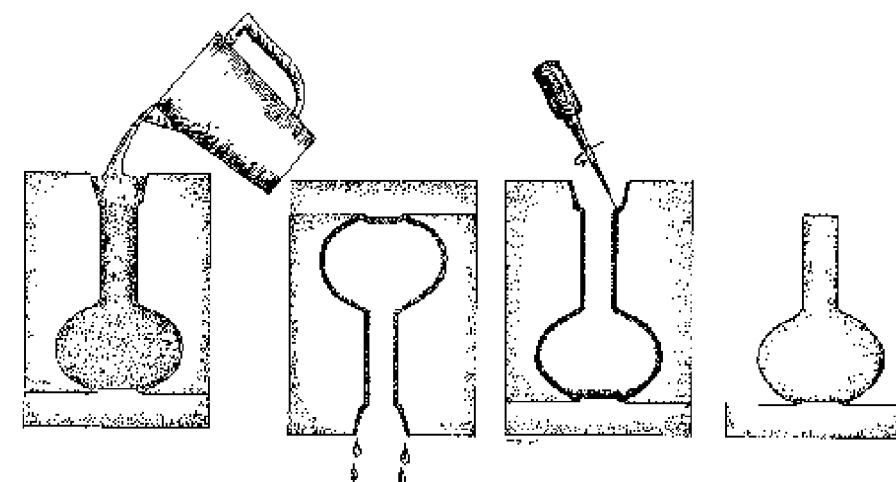




### CERAMICHE RIGONI, CERAMICS LABORATORY, NOVE

Gypsum moulds are assembled and ready for slip casting for the production of ceramic objects.

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### SLIP CASTING STEPS OF MOULD ASSEMBLY

Pouring of the slip, emptying the drain residue, and partial drying.

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**ITALIAN ART DECORATION SRL, MAROSTICA,  
PRODUCTION OF GYPSUM CAST WALLS**

**Maison Margiela Artisanal Show, Studio Anne Holtrop, 2018**

**1:10 gypsum models made in the studio in Bahrain were 3D scanned in Amsterdam. This scanning data was then used for CNC milling of 1:1 scale PS moulds. Craftsmen cast positive forms into the moulds by inserting gypsum plaster and natural plant fibre by hand.**









**TEXTILE GYPSUM CASTING, MAISON MARGIELA,  
STUDIO ANNE HOLTROP, 2018**

In our work for Maison Margiela and creative director John Galiano, we started by defining gestures of making in relation to materials. Based on the unique codes of Maison Margiela, like 'dressing in haste', 'the memory of' and the 'décortiqué', the material gestures were used to create a new architectural identity for Maison Margiela. One of the core elements are the gypsum casts in textile formwork. Due to the flexibility of the textile, the cast results in a different form every time. After removing the textile formwork, the imprint of the textile remains visible on the surface of the walls and columns, together with the pleats of the textile and volume of the gypsum that pushed the formwork out. The walls and columns are typical architectural elements. They are the primary space definers.





**GIPSOTECA CANOVIANA, POSSAGNO, CARLO SCARPA, 1957**

The Canova Museum collects many of the preparatory gypsum models that were later translated into his marble works. The Museum opened in 1844 and some additional spaces were commissioned for Carlo Scarpa in the 1950s to accommodate some of the sculptor's very large works. However, Scarpa ensured not to exhibit those artworks in order to privilege the dimension of the space and not treat it merely as a container for the art pieces.

**DAY 4      THU, MAR 21**

The gypsum prototypes of Canova, as well as his stucco and scagliola works, are an example of how gypsum is applied in a wide range of craftsmanship. Each of these has a peculiar tradition and development, and associates gypsum with other materials, which result in very different outcomes.



#### **UNI.S.VE., STUCCO WORKSHOP, VENICE**

The stucco workshop acknowledges applications and techniques in the field of stuccos in Venice. Some of these are “stucco marble,” which mimics the texture of marble and is created by stirring mixtures of different colours and densities into gypsum; stucco in high relief decoration; gypsum in mortar used with straw for the construction of ceilings; white and coloured “marmorino”.





### **RESTORATION OF STUCCO INTERIORS**

Many of the 18th century stuccos are in precarious conditions. Having been exposed to moisture and passing of time their surface is subject to corrosion and reinforcing materials such as metal wires and vegetable fibers begin to emerge. For this reason today, artisans still apply the stucco techniques in the restoration phase.





**MUSEO CANOVA, CARLO SCARPA, POSSAGNO, ITALY**



**ANTONIO CANOVA, 1757–1822**

Canova used an interesting method to copy 1:1 gypsum models to a mass of marble. 'Repère' bronze nails on the gypsum model were key to the method. He measured the distance between 'Repère' using a machine, 'Tellaio,' which had plumbing strings on the wooden frame. He used clay to make the first prototype and cast it to a gypsum model before eventually translating it into marble.





### RESTORATION OF STUCCO INTERIOR

Today, stucco pieces are cast into silicon moulds in the craftsmen's laboratories and later installed on the ceilings and walls.

The bonding material used for the pre-existing and new parts is generally a gypsum-based mortar.



### SCAGLIOLA

Scagliol literally means 'made with chips'. It is a technique that became very popular during the 17th century to substitute hard and precious stones such as marble with an agglomerate of selenite, glue and natural pigments. Mixing and elaborating these elements makes it possible to perfectly imitate the nuances and textures of marble. Nowadays, this technique is still widespread throughout Italy.







**PALAZZO ALBRIZZI, VENICE, 1690–1710**

Palazzo Albrizzi is probably the most scenographical example of Venetian Rococo gypsum stuccos. The stuccos are not merely a decoration but have a strongly narrative quality of the space as well as being a representation of the aesthetics and the tastes of 18th century culture.

**DAY 5      FRI, MAR 22**

Gypsum is the manifesto material of the Rococò period as much as reinforced concrete is of the Modernist movement. Through its intrinsic plasticity and lightness are born lively, suspended compositions simulating waving and folding textiles, expressing the desire of lightness and joyousness of the contemporary aristocracy.

The stucco technique allows a more agile and dynamic composition than real sculpture, thanks to the ease of execution and the infinite adaptations of the material. Unlike marble sculptures, which involve a subtraction of material, this kind of art implies material addition as well as modeling and sanding a mixture composed of lime, gypsum and marble powders. These are combined with a specific amount of water and acquire a soft consistency similar to plasticine, which hardens very quickly and therefore demands very experienced craftsmanship.



In very large and protruding figures, such as portraits and embossed ornaments, the stucco is just a thin layer worked over a strong base of lime and sand, made on a wooden skeleton, pins and wired metal.

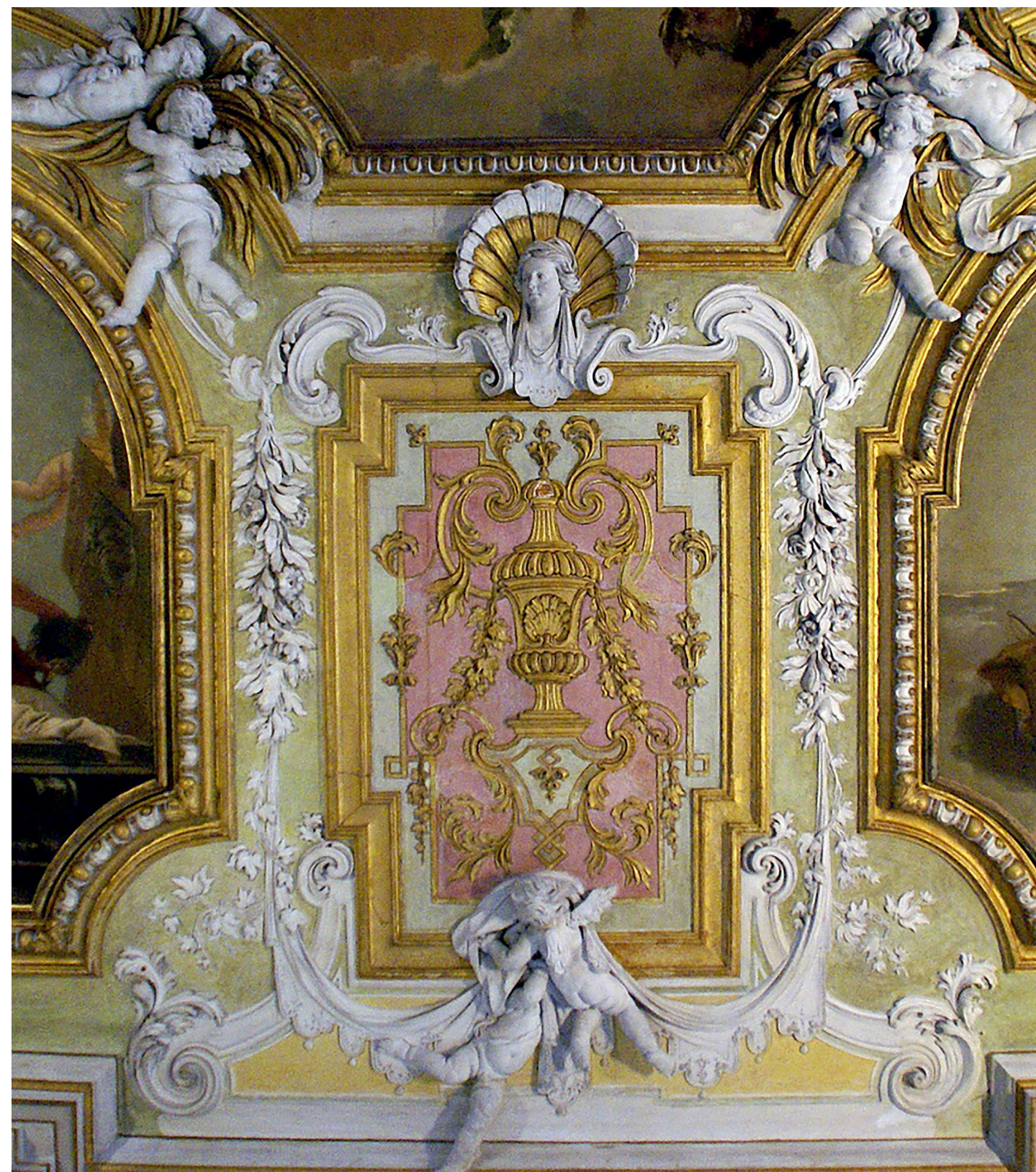


**PALAZZO ALBRIZZI, SALONE**  
**53**





**SCUOLA GRANDE DEI CARMINI, 1728-29**  
**Architect Baldassarre Loghena and stuccos from Alvise Bossi.**  
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**SCUOLA GRANDE DEI CARMINI, 1728-29**  
**Detail of the stuccos from Alvise Bossi in the Sala del Capitolo.**  
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**PALAZZO ZENOBIO AI CARMINI, 1695, BALL ROOM,  
STUCCO FROM ABBONDIO STAZIO**

Abbondio Stazio is recognized as the most prominent stucco artist in the history of Venice. He was born in Switzerland and, like most of the artists at that time, traveled to Rome where he was trained. Most of his masterworks were created in Venice in some of the Palazzos of the new noble families who were seeking recognition and an honourable reputation.





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### **DAY 1**

#### **SAINT GOBAIN – GYPROC**

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