



**Figure 2.1:** *Visit of Louis XIV and Colbert to the Académie des Sciences in the Jardin du Roi, title page for Claude Perrault, Mémoires pour servir à l'histoire naturelle des animaux, 1671, engraving by Goyton after Sébastien Le Clerc.*

## 2. Opening lecture: The Observatory of the Sun King and Classical Astronomy

*Michael Petzet (Munich, Germany)*

At the start of an international symposium on observatories around 1900, at the turning-point “from classical astronomy to modern astrophysics”, it might make sense to look back briefly at the creation of the Paris Observatory, one of the most important classical observatories – a unique testimony to an era dominated by the Sun King Louis XIV. During this era revolutionary innovations also took place in the field of astronomy. The Paris Observatory, a chief work of Claude Perrault,<sup>1</sup> the architect of the Louvre colonnade, appears in the background of an illustration of the Optics in Charles Perrault’s Cabinet des Beaux-Arts (fig. 2.2, p. 26).<sup>2</sup>

The foundation of the observatory was the immediate consequence of the foundation of the Académie des Sciences by Colbert in 1666: “*La première chose que M. Colbert fit entendre à ceux qui furent choisis et dans la France et dans les pays estrangers pour composer cette académie, fut . . . que pour un observatoire, dont l’astronomie ne pouvoit se passer, ils n’avoient qu’à choisir un lieu qu’ils jugeassent propre pour y bien observer, et qu’aussytost il y seroit construit un édifice qui non-seulement surpasseroit en grandeur; en beauté et en commodité les observatoires d’Angleterre, de Danemark et de la Chine, mais, ce qui estoit tout dire, qui répondroit en quelque sorte à la magnificence du prince qui le faisoit bastir.*”<sup>3</sup>

At first there were plans to erect the observatory on Montmartre. However, due to smoke formation above the city there was only limited visibility at this site. Therefore, instead a site was chosen at the exit of Faubourg Saint-Jacques. In a solemn ceremony on 21 June 1667, the day of the solstice, the astronomers and mathematicians of the Academy drew the meridian on a stone and thus defined the exact position of the building: “*Comme ce bâtiment devait être tout savant, et qu’il était principalement destiné aux observations astronomiques, on voulut qu’il fût posé sur une ligne Méridienne et que tous ses angles répondissent à certains Asimuths. Les mathématiciens tirèrent une Méridienne et huit Asimuths avec tout le soin que leur pouvaient inspirer des conjectures si particulières . . . Toutes ces observations furent la consécration du lieu.*”<sup>4</sup> Together with the most renowned scientists of the time, among them the astronomers and mathematicians Jean Pi-

card, Adrien Auzout and Gilles Personne de Roberval, the physicists Christiaan Huygens and Edme Mariotte, Claude Perrault, the physician and versatile scientist concerned also with architectural designs, was also accepted at the Academy. As early as on 15 January 1667 he had presented to the Academy newly drafted work programmes on anatomy and botany.<sup>5</sup>

The title page of his *Mémoires pour servir à l’histoire naturelle des animaux* of 1671 (fig. 2.1, p. 24)<sup>6</sup> shows a visit of Louis XIV and Colbert to the scholars of the Académie des Sciences in the Jardin du Roi. In addition, the view from the window shows the observatory under construction, “moved” by the illustrator close to this garden. As a member of the Academy familiar with all kinds of scientific experiments, Perrault was considered by Colbert to be ideal for the planning of a building for scientific purposes, also in view of the fact that in 1667 he was commissioned to translate Vitruvius and became member of the Petit Conseil that since April had to deal with the designs for the Louvre façade. The perspective view of the first project of 1667 (fig. 2.3, p. 27),<sup>7</sup> a design by his own hand, is closely related to a perspective view of the Louvre in the Bibliothèque Nationale, drawn at the latest at the beginning of the following year.

The design of the first project cannot be understood without the scientific purpose of the building, which Claude Perrault explained on the margin of one of the plans destroyed in the fire of the Tuileries in 1871: “*Le bastiment de l’Observatoire est construit de telle sorte qu’il peut suppléer tout seul à tous les principaux instrumens d’astronomie dont on se sert pour les observations. La situation donne une ligne méridienne dans l’étage haut, depuis la fenestre du milieu qui regarde le midy jusqu’à celle qui regarde le septentrion, de 17 toises de longueur, la plus juste qui se puisse faire. Les deux pavillons octogones sont coupés de manière qu’un de leurs pans donne le lever du soleil au solstice d’hiver; et l’autre son coucher au mesme solstice; qu’un autre donne le lever du soleil à l’équinoxe et l’autre le coucher au mesme équinoxe; que deux autres pans donnent l’un le lever du soleil d’esté et l’autre le coucher du mesme soleil.*”<sup>8</sup>

The centre of the building is defined by a shaft for a spiral staircase leading down to the underground corri-



**Figure 2.2:** Illustration of the Optics, in Charles Perrault's *Cabinet des Beaux-Arts*, 1690, in the background the observatory, engraving by Louis Simmoneau after Nicolas Corneille.

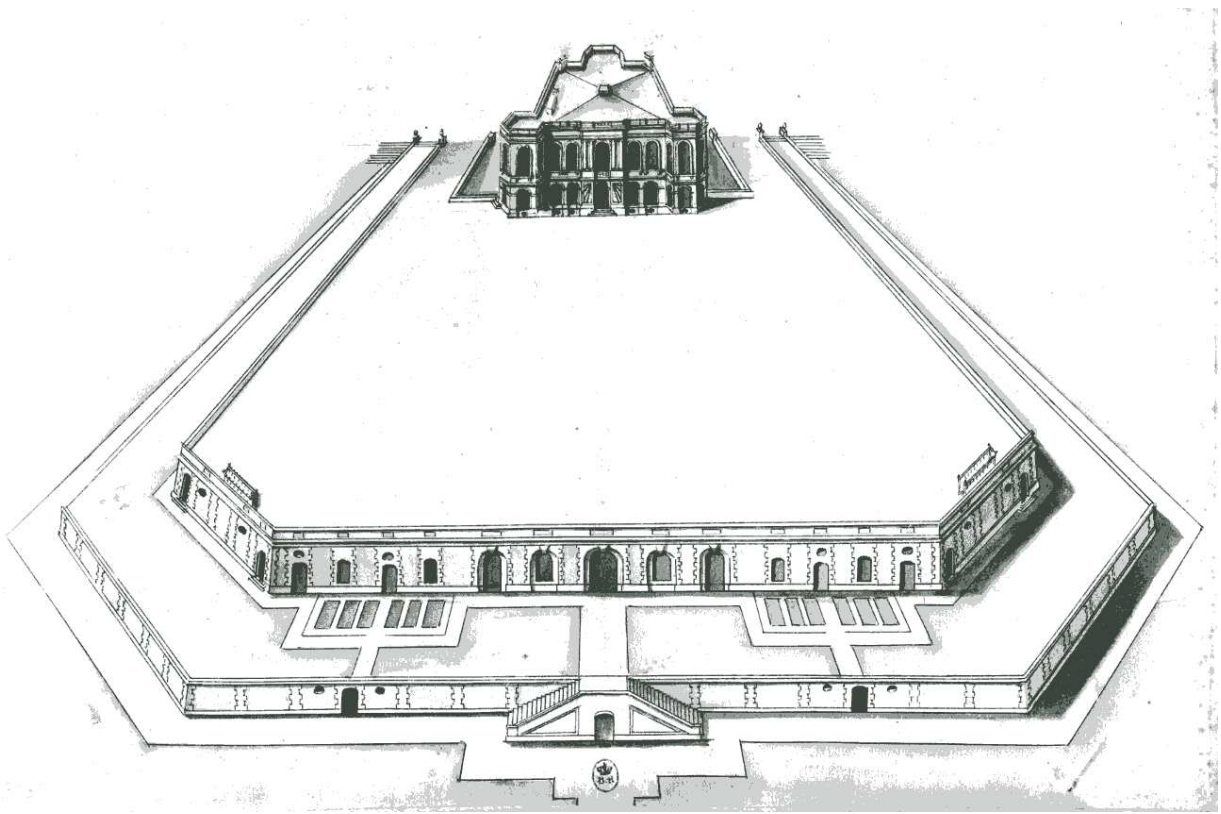
dors. Through circular openings in the vaults this shaft continues up to the roof terrace. Although the old guide-books were mistaken to believe that this 55-metre shaft enabled one to see the stars in full daylight,<sup>9</sup> Claude Perrault claimed that without the aid of an instrument it could indicate the zenith: “*Le trou ou ouverture qui perce l’Observatoire depuis le fond des carrières jusqu’au dessus de la terrasse donne juste le zénith, sans qu’on ayt besoin pour tout cela de quart de cercle ni d’aucun autre instrument.*”<sup>10</sup>

The development of the first design was most likely accompanied by a lively discussion between Perrault and his colleagues at the Academy of Sciences. It is certain that only the famous Uranienburg of Tycho Brahe came into question as a starting point for the planning of the Paris Observatory, since at that time even well-known astronomers had to content themselves with relatively primitive observatories – e. g. Johannes Hevelius in Danzig, who made his observations from a platform erected around 1660 on top of the roofs of three houses – and since the Round Tower in Copenhagen erected in 1642 under Christian IV, a simple seven-storey watch tower of 15 m diameter, can still be considered as exemplary. The observatory on the island of Hven near Copenhagen, which Brahe called Uranienburg after the Muse of Astronomy, had already long disappeared at the time of Perrault. Nonetheless, in his works the astronomer Brahe described the appearance of the building, erected between 1576 (laying of the foundation stone) and 1581, and illustrated them with woodcuts –

view of the main building, plan of the ground floor and overall view (fig. 2.4, p. 28).<sup>11</sup> Immediately after Brahe left the island in 1597 the observatory fell into disrepair and was dismantled by the island’s inhabitants; only the foundations were excavated in 1901/02.

With laboratories in the cellar, the astronomer’s apartment and the library on the ground floor, and guest rooms for King Frederic II and his wife Sophie on the upper storey the Uranienburg had to fulfil similar additional functions as the Paris Observatory. In the modern reconstruction the round room in the axes of coordinates is open right up to the ceiling of the cupola’s octagonal tambour that crowns the building. The north tower of Perrault’s first project appears like a deliberate quotation of the rectangular porch on the east façade of the Uranienburg with its chamfered corners on the upper storey. Finally, an underground corridor is mentioned which was constructed to connect the Uranienburg with Brahe’s “Stjerneborg”, an underground observatory installed in 1584 in a hill further south. The Stjerneborg’s loosely arranged and circular-shaped observatories of different diameters seem to anticipate the modern observatories of our time.<sup>12</sup>

In connection with this reference to Tycho Brahe’s Uranienburg Paris also intended to continue the observations of the *restaurateur de l’astronomie*<sup>13</sup> and for that purpose sent Jean Picard to Copenhagen in 1671. Picard was commissioned to make measurements on the grounds of the destroyed Uranienburg to determine the relation between the meridian there and in Paris.



**Figure 2.3:** Claude Perrault, first project for the Paris Observatory, perspective view of 1667 with the terrace and the south facade.

This was a prerequisite for an exact comparison between the new observations of French astronomers and Brahe's old observations. Picard was able to buy Brahe's original manuscript for Paris.<sup>14</sup> However, if on the title page by the engraver Duflos<sup>15</sup> the Paris Observatory is shown between the Uranienburg and the Round Tower in Copenhagen (fig. 2.5, p. 29), this is not so much a reference to the important old tradition of the building's appearance. Instead, this is done to emphasise Louis XIV's observatory as the source of a new tradition.

According to Colbert's above-quoted demand this observatory was to exceed all others *en grandeur, en beauté et en commodité*. In fact, the exterior of the Uranienburg with its domes and conical broach roofs of the various observation stations, decorated by Tycho Brahe's Dutch architects (the court architects of Danish King Frederic II, at first probably Hans von Paschen, later Hans van Stenwinkel) did not have anything of the *noble simplicité*, which Perrault used by avoiding the order of columns and structuring the flat, closed block with rows of round-arched windows, thus giving the building a "Roman" appearance. In a way, he wanted to create a classical observatory without a direct classical model – *en attendant que les somptueux Edifices que S. M. fait construire en France soient en état de servir eux-mêmes de modele à la posterité...*<sup>16</sup> Therefore, Perrault also published Sébastien Le Clerc's engravings of the plans and views of the observatory in his *Vitruvius* (fig. 2.6 and fig. 2.7, p. 30 and 31).<sup>17</sup>

Already Florent le Comte remarked on the observatory's austere and fortification-like architecture, which in fact was intended by Louis XIV to serve as a model for new architecture: *L'Observatoire basti ... d'une forme qui plait sans le secours des ornements est une modèle d'Architecture militaire*,<sup>18</sup> – the model of an architecture whose austere forms were related to Vauban's fortifications built at the same time, the only difference being that Vauban's star-shaped ground plans took into account the course of the aggressors' bullets and not the course of the stars. The verso of the medal coined on the occasion of the laying of the foundation stone (fig. 2.8 below, p. 32) shows – quite in accordance with this approach – the observatory at the top of two terraces that appear like a steep rock plateau, the south façade being crowned by a gigantic, cannon-like telescope, in addition the motto *SIC ITUR AD ASTRA*. According to the explanation of a contemporary engraving by A. Perelle, who showed the completed observatory with great numbers of scientists at work (fig. 2.9, p. 33),<sup>19</sup> the building with its towers dominating the terrace in the south is evocative of a citadel, – a citadel of the sciences, where for the glory of the Sun King instead of canons the sky is to be conquered with telescopes. In fact, the satellites of Saturn discovered later by Cassini were named "satellites ludovicae" in honour of Louis XIV. Thanks to the sciences the Sun King could conquer the world by conquering the sky, as astronomy found its most important application in geography and navigation.

ORTHOGRAPHIA PRÆCIPVÆ DOMVS

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ARCIS VRANIBVRGI IN INSV-  
SIA VULGO HVENNA,  
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EXÆDI-

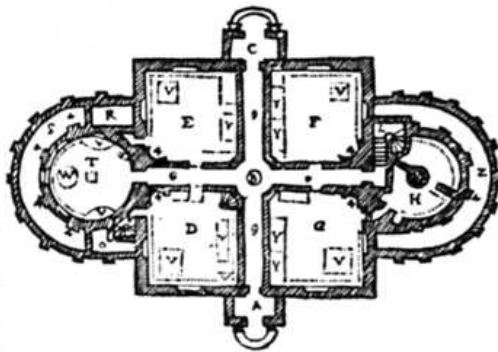
LA PORTHMI DANICI VENV-  
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5



ICHTNOGRAPHIA ET EIVS EXPLICATIO.

A Ianua Orientalis. C. 4. ad angulos rectos postea in tres redacti sunt, sive hypocaustum D angulo post fornacem, par-laboratorium spagyricum que distinctim erant furni, isthic operi Pyronomico in-majus illud descendendum lubilem rotans, qui aquas sublime eiaculabatur. D. num. E. F. G. Cameræ pro ascensu in superiorem con-K. Puteus cementitius 40. ul-draulico seruiens & aquas culte per murum transeuntes in singulas Cameræ tam superiores quam inferiores distribuens. P. Gradus pro descensu in laboratorium Chymicum. T. Bibliotheca. W. Globus magnus Ori-chalcicus num. 22. exhibitus. V. Quatuor Mensæ pro Studiosis. 4. Camini tam e laboratorio inferiori ascendentes, quam in quatuor angulis conclavium. Y. Lecti in ijsdem conclavibus, hinc inde dispositi. Cætera acutus inspector propriâ intentione facile discernet. Intelligenda autem sunt hæc omnia in eâ quantitate, veluti fundamento majoris domus supra depictæ quadrare poterunt: Licet hic coarctationis loci gratiâ in duplo quasi minori formâ exhibeantur.



Occidentalis. 6. Transitus concurrentes, qui tamen ut Cœnaculum hybernium pliaretur, atque in ejus an-vum quoddam & secretum eBet, in quo tamen quin-qui promptius ad manus serviebant, ne semper in foret. B. Fons aquarium vo-hinc inde cum lubuit, in Cœnaculum illud hyber-hospitibus. L. Gradus pro tignationem. H. Coquina. nas profundus, artificio hy-per siphones hinc inde oc- 10  
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EXPLICATIO

Figure 2.4: East view and ground plan of the Uraniborg In: Tycho Brahe: Astronomiae Instauratae Mechanica, 1598.

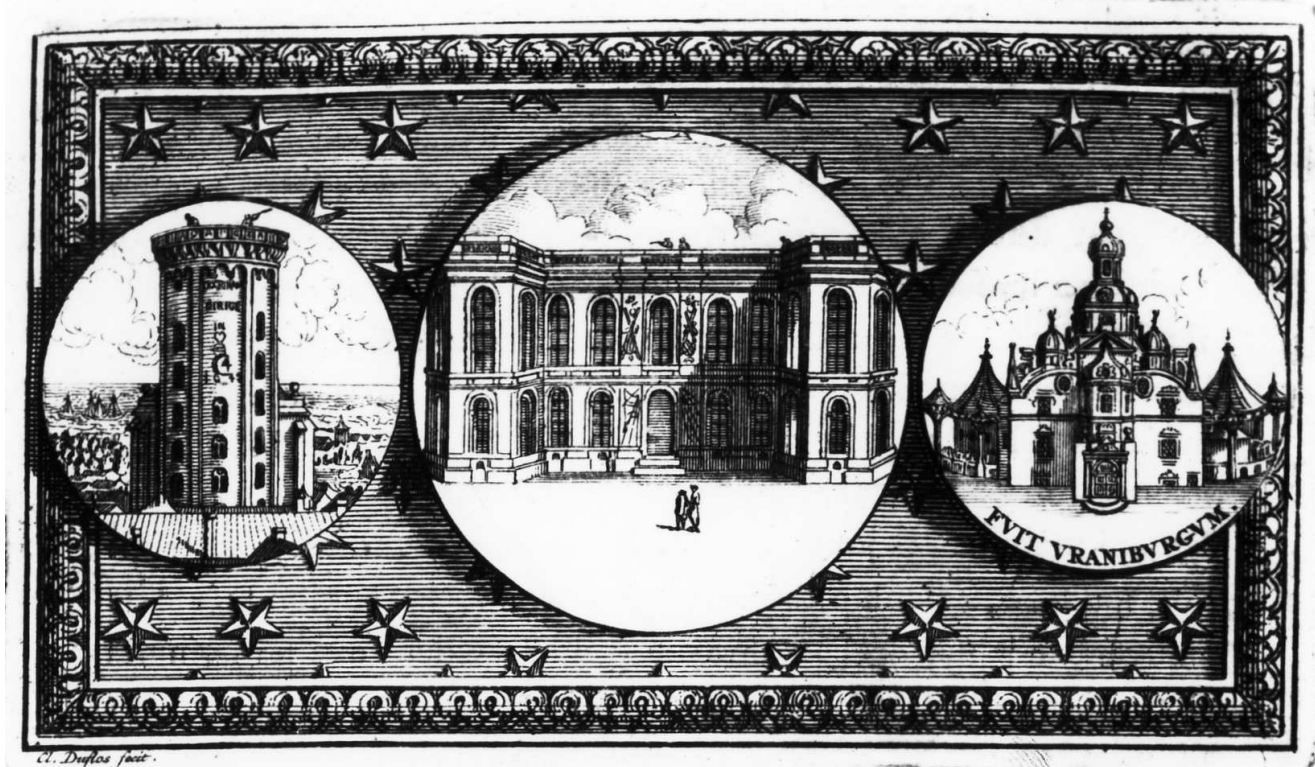


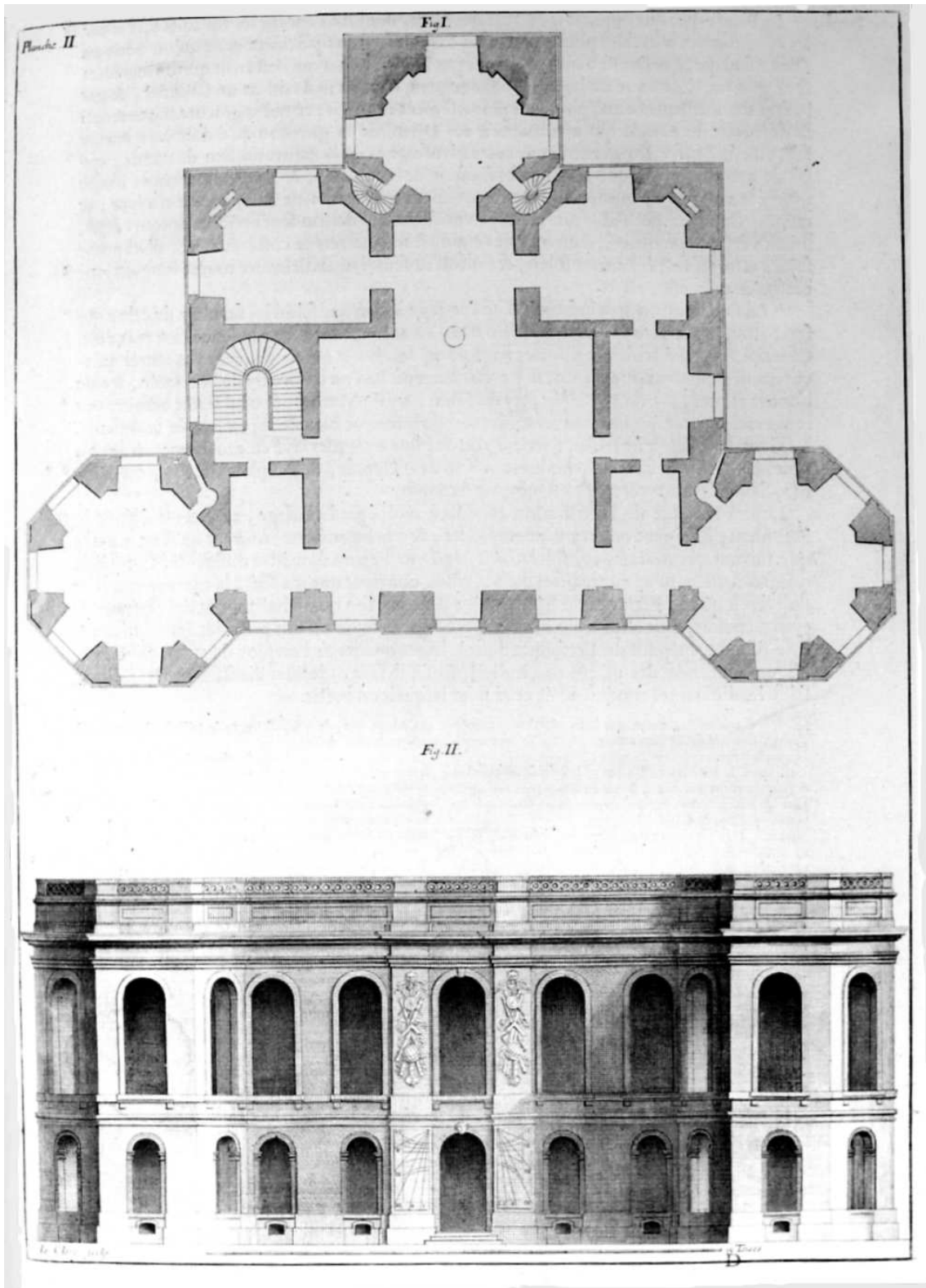
Figure 2.5: Title page for Giovanni Domenico Cassini: *De l'origine et du progrès de l'Astronomie*, 1731.

The walls of the observatory had already been erected up to the height of the first floor when Gian Domenico Cassini (1625–1714) arrived in Paris on 4 April 1669.<sup>20</sup> The astronomer in the service of Pope Clemens IX was the only one among Europe's most renowned astronomers to respond to Colbert's calling (Colbert had also invited Leibniz, Hartsoeker, Tschirnhausen, Hevelius, Viviani and Newton). Cassini, who would have preferred to pull down Perrault's three towers, asked for a spacious hall on the second floor: *"j'aurais voulu que le bâtiment même de l'Observatoire eût été un grand instrument, ce que l'on ne peut pas faire à cause de ces tours qui, d'ailleurs, étant octogones, n'ont que de petits flancs coupés de portes et de fenêtres. C'est pourquoi je proposai d'abord qu'on n'élevât ces tours que jusqu'au second étage, et qu'au-dessus on bâtit une grande salle carrée, avec un corridor découvert tout à l'entour ... Mais ceux qui avaient travaillé au dessin de l'Observatoire opinaient de l'exécuter conformément au premier plan qui en avait été proposé ; et ce fut en vain que je fis mes représentations à cet égard et bien d'autres encore."*<sup>21</sup>

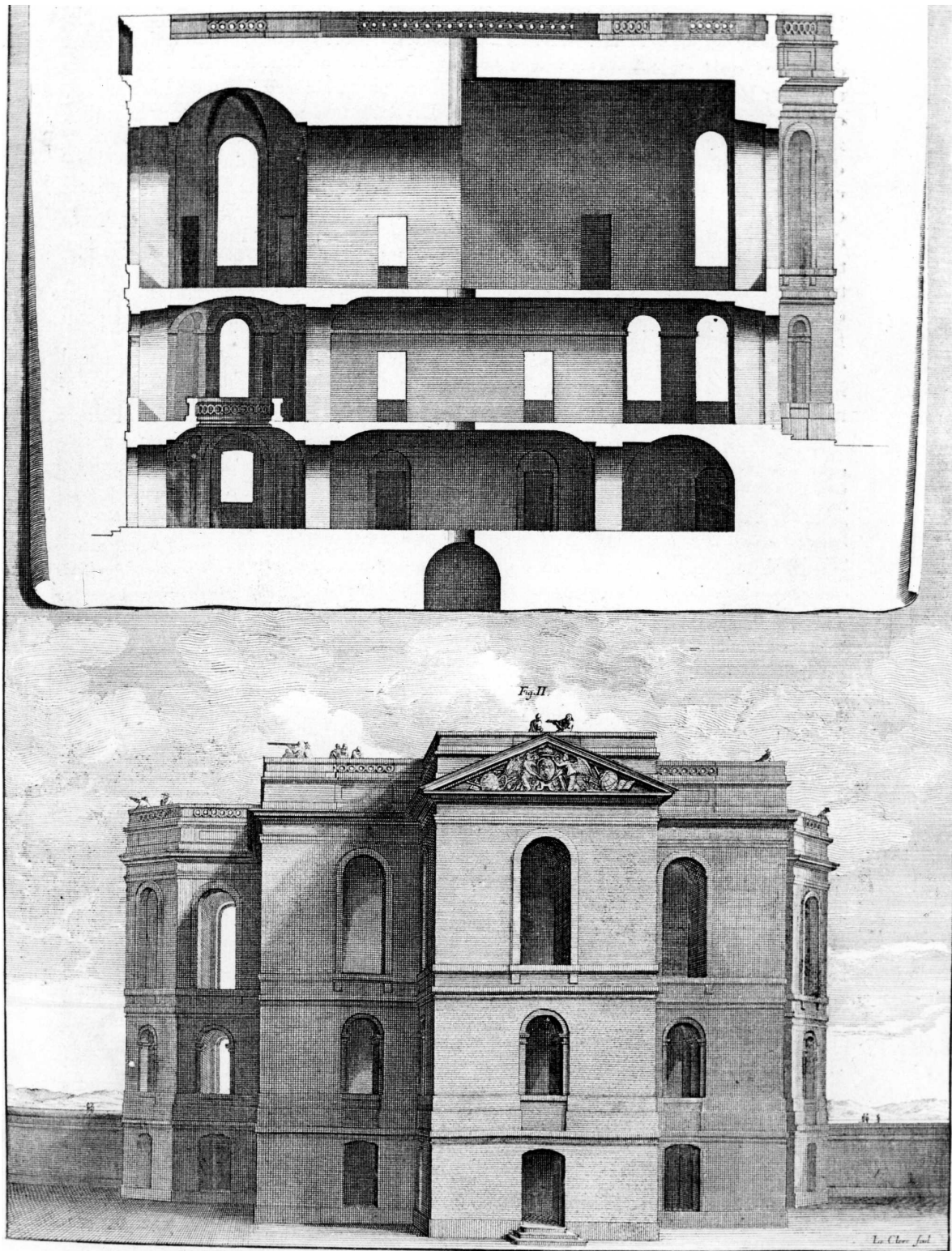
It seems Perrault and Cassini, each in his own way, wanted to make this building an outstanding instrument of astronomy. However, contrary to the architect the astronomer wanted the *magnificence* to be completely subordinated to the *commodité*. Besides, Cassini's allegations were almost inevitable, since the foundation of the observatory took place in an era when Picard's and Auzout's new instruments replaced Tycho Brahe's old instruments. These were innovations that Perrault

could not yet take into consideration in his first design. Basically, astronomers could not ask for much more than a tall building, from where the whole sky could be seen. The Greenwich observatory erected by Christopher Wren only a few years later, 1675/76, for the first royal astronomer John Flamsteed does have a spacious hall on the upper storey, above the astronomer's apartment, as Cassini had requested; however, in comparison to its Parisian forerunner it is much smaller and simpler.<sup>22</sup> Furthermore, according to its original determination the Paris observatory was not merely intended for the astronomers but for all colleagues at the Academy of Sciences. Therefore, it had to provide space for meetings of the Academy. The underground corridors and the foundations of the terraces were particularly suitable for physical and chemical experiments.

The final layout of the observatory with the hall on the upper storey as an afterthought was developed as a reaction to Cassini's criticism. The observatory's exterior was completed in 1672 with the relief in the pediment and the trophies on the south façade made by the sculptor Francesco Temporiti. Even after Cassini had moved into the observatory in 1671 for several years there were still craftsmen working on the interior. The official date of completion was 1 May 1682 when Louis XIV paid a visit to the observatory. As architect of the observatory Claude Perrault had created a monument that owing to its "simplicité", adequate for the building's use as a scientific instrument, could still be considered a model in the late 18<sup>th</sup> century: *"Cet édifice dont la masse, l'ensemble et les détails portent ce caractère simple et*



**Figure 2.6:** Plate II of Perrault's *Vitruvius* (1673), ground plan of the second storey and elevation of the observatory's south façade, engraving by Sébastien Le Clerc.



**Figure 2.7:** Plate III of Perrault's *Vitruvius* (1673), longitudinal section and perspective view from the north, engraving by Sébastien Le Clerc.



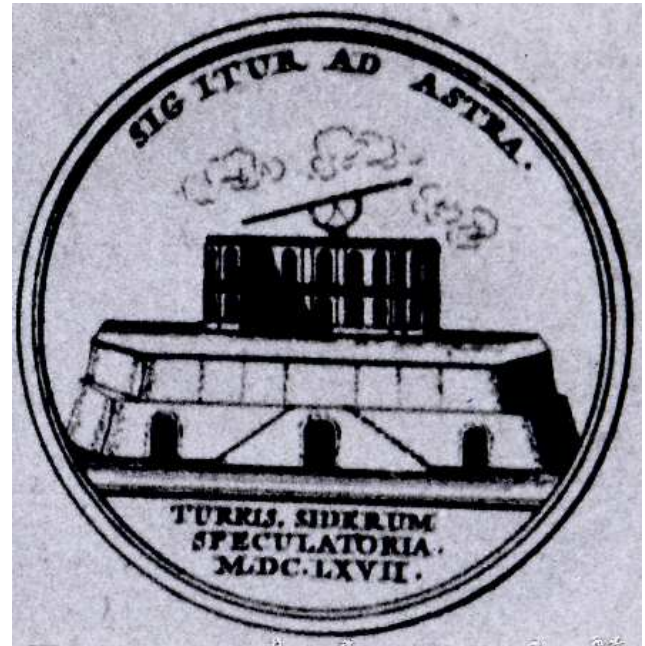


Figure 2.8: Medal for the laying of the observatory's foundation stone, 1667.

noble, qui convient à la science et aux usages auxquels il est consacré, est un de ces monuments publics qui caractérisent le mieux le goût et le génie du siècle de Louis XIV.”<sup>23</sup>

What this building meant for the Sun King, who was always intent on “grandes choses”, is probably summed up best in the *Voyage d’Uranienbourg* by Abbé Jean Picard, Perrault’s colleague at the Academy of Sciences: “On peut dire que l’Astronomie a pour objet ce qu’il y a de plus grand dans l’Univers: aussi a-t-elle eû toujours l’avantage de trouver accès auprès des plus grands Monarques; & Sa Majesté a bien voulu faire voir le soin particulier qu’Elle prend pour l’avancement de cette noble Science, en faisant bastir un Observatoire, qui parmi les Arcs de triomphe & les trophées demeurera comme une marque éternelle du Regne heureux de Loûis le Grand.”<sup>24</sup>

1. Petzet (1967). Petzet 2000, S. 355–397.  
 2. Perrault, Charles: *Le Cabinet des beaux Arts*, 1690. – On the history of the Paris Observatory see also Wolf 1902. Débarbat et al. 1984.  
 3. Perrault, Charles: *Pourquoy et comment l’observatoire a esté basty*. Mémoire of August 1667, after Clément 1861–1873, V, pp. 515–516. – On the foundation of the Académie des Sciences see also Perrault: *Mémoires de ma vie*, publ. par Bonnefon 1909, p. 42 ff.  
 4. *Histoire de l’Académie des Sciences*, vol. I, p. 43.  
 5. See in detail Picon, Antoine: *Claude Perrault, 1613–1680, ou la curiosité d’un classique*, 1988, pp. 44–52.  
 6. Title page for Claude Perrault: *Mémoires pour servir à l’histoire naturelle des animaux*, Paris 1671–1676, engraving by Goyton, signed *S. Le Clerc in. et f. and Goyton ex.*

7. BN, Estampes, Va. 304 I, no. 69 (red no. 1730), perspective view of the first project with the terrace and the south façade of the observatory: pen drawing, 305 × 393 mm, at the top title written by Claude Perrault: *Elevation perspective de l’observatoire*.  
 8. Description on the margin of the lost “plan principal”. Clément 1861–1873 (see note 3), vol. V, p. 516.  
 9. Brice, Germain: *Description nouvelle de Paris*, 1684, p. 101: “On dit qu’il a esté fait exprès pour voir les Astres en plein jour, cependant personne ne les a vû jusqu’à présent, quoique l’on y eut souvent regardé.”  
 10. Description on the margin of the lost “plan principal” (see note 8).  
 11. The oldest illustration with east elevation of the main building, plan of the ground floor and overall view can be found in a woodcut that Tycho Brahe sent to his benefactor, Landgrave Wilhelm IV of Hessen (illustration in Dreyer: *Tychonis Brahe Dani Opera Omnia*, vol. VI. Hauniae 1919, pp. 348–349). This was followed by similar woodcuts in Brahe’s *Epistolarum Astronomicarum Liber Primus* of 1596 (Dreyer 1919, vol. V, pp. 138, 142). An exact reconstruction with ground plans, elevations and sections, taking into consideration Brahe’s information and the excavation results was attempted by Christensen and Becket: *Tycho Brahe’s Uraniborg and Stjerneborg on the island of Hveen*. London, Copenhagen 1921.  
 12. Ground plan and view of the Stjerneborg in Brahe’s *Epistolae astronomicae* (1596) and in *Astronomiae instauratae mechanica* (1598); Dreyer 1919, vol. VI, pp. 293 f; vol. V, p. 146.  
 13. Cassini: *De l’origine et du progrès de l’Astronomie*, 1731, p. 29.  
 14. Picard: *Voyage d’Uranienbourg*, 1731, p. 61 ff.  
 15. Title page for Cassini: *De l’origine et du progrès de l’Astronomie*, 1731 (see footnote 13), signed *Cl Duflos fecit*.  
 16. Perrault, Claude: *Les dix Livres d’Architecture de Vitruve*, 1684, preface.

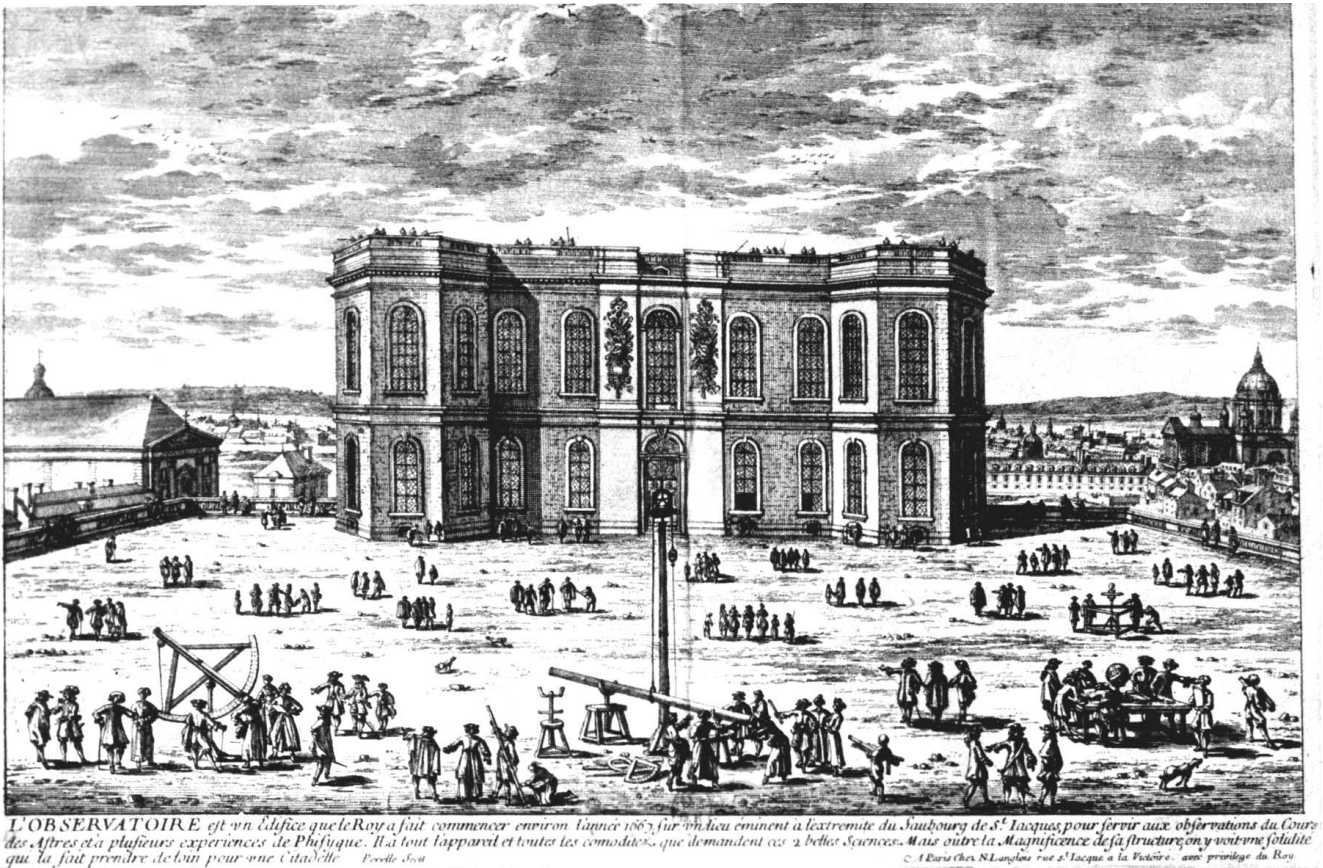


Figure 2.9: View of the observatory from the south, engraving by Adam Perelle.

17. Perrault, Claude: *Les dix Livres d'Architecture de Vitruve*, Paris 1673, plates II and III, signed *Le Clerc sculp.* (pp. 10–13); Perrault, Vitruve, 1684, plates II and III (pp. 13 and 15).
18. Comte, Florent le: *Cabinet des Singularités d'Architecture, Peinture etc.*, 1699.
19. View of the observatory from the south, signed *Perelle fecit.*
20. For Cassini's life and work see Wolf: *Observatoire*, 1902 (see footnote 2); Brazza 1941, pp. 35–64; Débarbat et al. 1984 (see footnote 2), p. 9 ff.
21. Cassini, Jean-Dominique: *Mémoires pour servir à l'histoire des sciences et à celle de l'Observatoire de Paris*. Paris 1810, p. 293, quoted after Clément V, p. 516.
22. On the Greenwich observatory see Sekler: *Wren and his place in European architecture*, 1954, p. 147.
23. Thiéry: *Guide des amateurs et des étrangers voyageurs à Paris*, vol. II. Paris 1787, p. 265.
24. Picard: *Voyage d'Uranienbourg*, 1731 (see footnote 14), p. 65.
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- PERRAULT, CHARLES: *Le Cabinet des beaux Arts ou Recueil d'Estampes gravées d'après les Tableaux d'un plafond où les beaux Arts sont représentés*. Paris 1690: engraving with illustration of the Optics, signed *N. Corneille, pinxit*, and *Simmonneau, sculpsit*.
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