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The Science of the Beautiful: S.C. Constant-Dufeux and the Parabola as Constructive and Symbolic Form

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« La tombe de l'amiral Dumont-d'Urville au cimetière du Mont-Parnasse est une composition si bizarre et si peu en harmonie avec la pieuse destination du monument, que nous ne savons quel nom donner à cette oeuvre. S'il était permis de plaisanter sur un sujet si grave, l'on ne tarirait pas » (Delaunay 1844, 388).

Few funerary monuments have garnered the kind of vitriol expressed for Simon-Claude Constant-Dufeux's (1801-1871) tomb for the admiral Dumont-D'Urville (Fig. 1). What for A.H. Delauney was a “bizarre” and “pain inducing” monument, for those architects and artists with knowledge of Constant-Dufeux's strong independent spirit, the tomb appeared to resonate with many of the aspirations of his generation. While some of the peculiar elements of the design have been described by recent historians, I will focus my paper on the parabolic profile of the tomb which, while central to Constant-Dufeux's conception of the monument, has remained largely unexplored.¹

Born in Paris on 5 January 1801, into a family with little means, Simon-Claude Constant *dit* Constant-Dufeux nonetheless had ancestors of some stature. Simon Dufeux, his maternal grandfather and whose name he would inherit, was a celebrated stone mason working on some of the most structurally daring projects of the day, including the architect and structural engineer Jean-Rodolphe Perronet's low elliptical-arched bridge in Neuilly. What sealed his reputation as *maître-appareilleur*, however, was his role in the building of Jacques-Germain Soufflot's Église de Sainte-Geneviève. An essay in 18th-century architectural légèreté, Soufflot's church suffered severe structural setbacks, the most important of which were first discovered by the young Simon Dufeux,

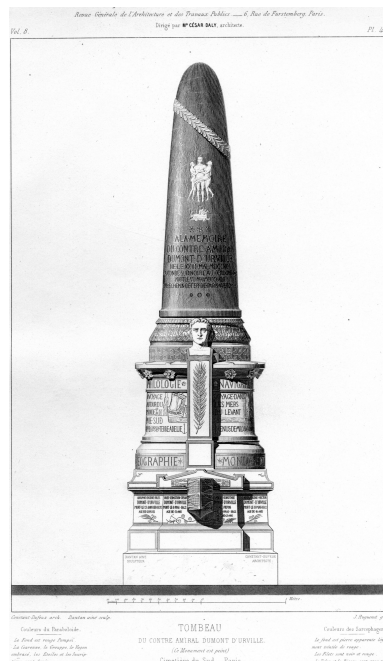


Fig. 1 : Simon-Claude Constant-Dufeux, 1849. Tombeau du Contre Amiral Dumont D'Urville. *Revue générale de l'architecture et des travaux publics* 8, plate 45.

who initially mistook the hairline cracks for cobwebs. “Après avoir visité et examiné chacun des piliers où les mêmes désordres se manifestaient,” Dufeux recounted Soufflot's devastation after

being shown the damage: j'entendis M. Soufflot qui disait à plusieurs reprises, en se frappant le front : "Je suis un homme perdu" (Féraud 1872, 81). But bad fortune turned into good, and as reward for his discovery, Dufieux would be given the concession for a quarry supplying the newly renamed Panthéon with building stone, thereby providing his grandson Simon-Claude Constant-Dufieux a childhood of modest but sufficient means.

As recounted by Pierre-Honoré Féraud, Constant-Dufieux's former pupil and biographer, two spheres of influence affected the young Constant-Dufieux: his grandfather's love for architecture and the military ambitions of his maternal uncle, a commander in the grenadiers de Lefèvre. While Constant-Dufieux's penchant was quite clearly for architecture, his parents placed him in a preparatory school for the École Polytechnique as a compromise between the competing career ambitions of his elders. It was at this time that Constant-Dufieux met Prosper Mérimée, two and a half years his junior, and with whom he would share a lifelong friendship. Constant-Dufieux would be indebted to Mérimée not only for a number of architectural commissions, but also for his eventual nomination as architect for the Commission des Monuments Historiques. The collapse of the Napoleonic Empire led not only to personal chagrin – like most adolescents at the time, Constant-Dufieux was drawn into the frenetic energy and exhilaration of the Napoleonic conquests – but the family suffered dire economic consequences as well. The family's military ambitions dashed, Constant-Dufieux was allowed to focus uncompromisingly on a career as architect.

His first employment in this direction came in 1815 for the architect Delépine, friend of Simon Dufieux and professor at the École royale gratuite de dessin de Paris. Constant-Dufieux worked in le père Delépine's office but also attended courses at la petite école, as the small decorative arts school was known. By 1817, Constant-Dufieux had entered the administration of the Ponts et Chaussées as *conducteur non embrigadé*, working on large water navigation projects in and around Paris.² The most important of these was under the direction of former Napoleonic engineer in the campagne d'Égypte, René-Édouard de

Villiers du Terrage, whose family tomb Constant-Dufieux would eventually design. The project, which involved the completion of the canals of Saint-Denis and Saint-Martin and the design of many of the locks and sluices, was published in large format under the title *Description du Canal Saint-Martin* with engravings drawn by Constant-Dufieux. In addition, Féraud cites two other projects while in the Ponts et Chaussées on which Constant-Dufieux would leave his modest mark. The first was directed by Villiers du Terrage's close friend and companion in Egypt, Jean-Baptiste Jollois, and involved infrastructural work in a northern arrondissement. Constant-Dufieux would design the Jollois' family tomb as well. The second, which involved work for the state navigation service, was directed by the famous French engineer and physicist Claude-Louis Navier, remembered for rendering the general theory of elasticity mathematically useful to the field of construction. The close collaboration with these and other engineers from the Ponts et Chaussées on projects that pushed the limits of structural and mathematical calculability would be significant for Constant-Dufieux's later theoretical concerns. Had Navier's theory of elasticity been developed at the time of Soufflot's construction of the Église Sainte-Geneviève, the forces that so devastated the central columns would, of course, have been properly predicted.

Constant-Dufieux would remain with the Ponts et Chaussées until 1825, and well into his studies in François Debret's atelier and at the École des Beaux-Arts. His prior work with the governmental corps of engineers set him apart from his classmates at the École and demanded to be reconciled with the very real historicist and Romantic concerns of his generation. Upon his return to Paris after a six year long trip to Rome [as Prix de Rome pensionnaire] and North Africa, one book in particular would provide the young architect with the theoretical tools to attempt such a reconciliation, Victor Cousin's very popular *Du vrai, du beau, et du bien*. Cousin believed that the proper road for philosophy lay in pitting opposed philosophical outlooks against each other. The complementary truths of each philosophical system would emerge out of this "éclectisme réfléchi." Architects for whom Cousin's philosophy had resonance, sought

out the *juste milieu* between the spiritual and the material, and the ideal and the real. While terms like these had been framed by Classicists such as Quatremère de Quincy in the early 19th century as strict opposites – one was encouraged to “generalize” from the local to the ideal, the latter eclipsing the former – Cousin’s philosophy of *abstraction immédiate* demonstrated that the one was simply sterile without the other. Furthermore, Cousin conceived of the reconciliation of divergent elements in symbolic terms and saw the artist as the chief protagonist for such a revelation: “Dans la nature” writes Cousin, “ce symbole est souvent obscure : l’art en l’éclaircissant atteint des effets que la nature ne produit pas toujours” (Cousin 1854, 177).

Constant-Dufeux reshaped Cousin’s philosophical eclecticism, with its tripartite banner of *le vrai, le beau, et le bien*, into an architectural eclecticism, subtly changing of the third term *le bien* into *l’utile*.³ In the design for the official medal of the Société centrale des architectes, Constant Dufeux integrated this *devise trinitaire* below a rich composition illustrating its precept with symbolic figures and vegetal motifs.⁴ And the axiom would resurface throughout his works, most notably in connection with the tomb that is the subject of this essay.

Much of what we know of the reception of the tomb to French explorer Dumont d’Urville comes from the solemn ceremonies that accompanied its inauguration in the cimetière du Sud (today the cimetière Montparnasse) on 1 November 1844. The monument stood at the center of a large crowd of government officials, dignitaries, and local inhabitants and was enveloped in a long white shroud and surrounded by golden lances strung up with garlands of laurel and yellow everlasting. The unveiling must have provoked some surprise for the polychromy of the monument was striking.⁵ Saturated greens and golds coloured the base (including on the bust of Dumont d’Urville) and the conical protuberance capping the monument was painted with a deep, “Roman” red, “comme une robe triomphale.” Constant-Dufeux’s speech, delivered moments following the unveiling, was both a justification for the unconventional elements in his work, and a brilliant exercise in the multivalency of interpretation. Justifying the polychromy of the monument, Constant Dufeux

argued that the red paint was morally useful in that it set the right tone and character for the monument; it was scientifically useful in that it protected the stone from wear and therefore upheld the specific demand of a tomb: to protect the memory of the person by physically defending itself from the ravages of time; and finally, the paint was artistically useful because it created a sense of harmony between the monument and the naturally bright and colourful vegetation around it. These three aspects of utility, the scientific, moral and artistic, he argued, were three sides of one unity.⁶ A truly unified piece of architecture was one that set up a matrix of meaning by which each element of the monument satisfied the three dictums.

While the particulars and colouring of the tomb were novel, the outline was informed by funerary and marking stones that were ubiquitous in primitive and classical civilizations across the globe. Constant Dufeux described the historical relevance of these forms: “elles étaient communes à toute l’antiquité. L’Égypte avait ses pyramides et ses obélisques ; la Grèce ses stèles ; l’Étrurie, les Romains de la république et de l’empire avaient aussi leurs tombeaux coniques, pareils à celui-ci ; la Sardaigne a ses nurhag ; et jusqu’à notre vieille Gaule, qui dans ses nombreux monuments, appelés menhirs, a consacré aussi cette forme conoïde qui défie les siècles. Témoin les grandes pierres levées, si nombreuses en Bretagne, comme celle de Locmariaker, et comme le menhir du camp Dolent, encore debout près de Dol” (Constant-Dufeux 1848, 443).

While the particular shape of the funerary marker had differed according to time and place, the general principals of the bottom heavy form and the insistence on monolithic construction had remained largely unchanged as they lent themselves well to monuments primarily concerned with durability.⁷ “Quoi de plus durable qu’un monolithe ?” he inquired, rhetorically, “Quoi de plus stable que la pyramide ou le cône ?” While Constant-Dufeux embraced these historical allusions, it is poignant that he would highlight the structural advantages of conical monuments, and even more so given the parabolic profile chosen for the tomb. But he described the arc traced by his monument in a different way a little further into his inaugural speech: “Nous avons adopté pour le contour du monolithe la parabole ; cette

courbe si belle, que décrit le projectile lancé dans les airs, et qui nous a paru être celle que l'oeil suit avec le plus de plaisir" (Constant-Dufaux 1848, 443) (Fig. 2). Two distinct explanations of the parabolic curve, the first suggested that he sought a form that would best capture the imagined weight bearing down on the monument, and the second, tracing the trajectory of a projectile thrown in the air. But were these two curves indeed the same? In other words, was the best shape for an arch as a form resisting its own vertical and horizontal forces a parabolic curve like that drawn by a projectile thrown in the air?

The answer to this question was an urgent one for men of science from the Renaissance to the mid-19th century. Galileo Galilei, upon discovering the parabolic trajectory of projectiles, famously dithered on whether that curve was indeed an equivalent to that thought to best resist vertical forces, the catenary. A catenary, the shape assumed by a hanging chain with a curve very similar to that of the parabola, was discovered to be the optimum

form for an arch of equal weight by English polymath Robert Hooke, who would inform the architect Christopher Wren of his findings. The interior dome of St-Paul's in London was designed in this way. The problem of the catenary would be solved mathematically some years later by the Bernoulli brothers. Soufflot, and after his death, Jean-Baptiste Rondelet, designed structural elements of the Panthéon using catenary arches after having experimented with a number of forms including paraboloids and extended elliptical arches. In his *Traité théorique et pratique de l'art de bâtir*, Rondelet assessed the structural effectiveness of various conical forms and concluded that, though unpleasant in appearance and requiring concealment, the catenary was the form best suited for spanning large areas. But the parabolic shape and the trajectory of projectiles would continue to be important for architects despite the ascendancy of the catenary in structural design. Witness for instance François Blondel's little book *L'art de jeter des bombes* published in 1685 which provided a number of ideal trajectories for bombing adversaries, all of which were parabolic in form.⁸ Or much later, Gottfried Semper's study *On Lead Slingshot Projectiles*.

The question over which of the two forms, the catenary and the parabolic, was most advantageous for modern structural design reemerged in the early 19th century with development of suspension bridge technology. Navier, who had employed the young Constant-Dufaux during his large public infrastructure projects in Paris in the mid 20s, provided the definitive solution to the problem. Unlike stone arches, the arc formed by the cables or chains in suspension bridges were weighted at periodic junctures along their run and the resultant form proved to be parabolic. Navier's results were widely published and they were the basis of the two-part article "Théorie des ponts extensibles" featured in the first volume of César Daly's *Revue générale de l'architecture et des travaux publics*, the preeminent architectural journal of 19th-century France and vehicle for Constant-Dufaux's own writing. There was perhaps something more personal in Constant-Dufaux's choice of the parabola for the tomb of Dumont d'Urville. "Apposer son cachet" was his catchphrase for the well recognized tendency for the idiosyncratic and autobiographical in Constant-Dufaux's work.⁹ While the choice of the parabola over the catenary

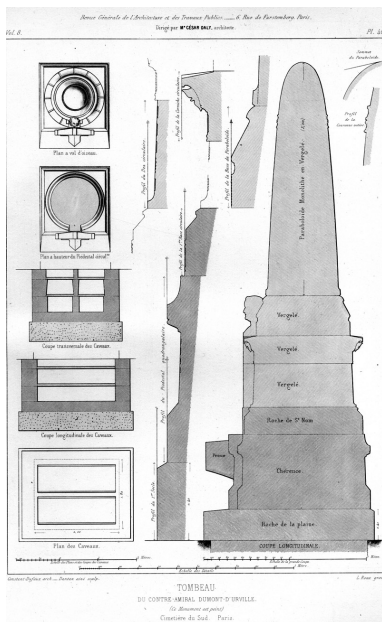


Fig. 2 : Simon-Claude Constant-Dufaux, 1849. Tombeau du Contre Amiral Dumont D'Urville, Coupe Longitudinale. *Revue générale de l'architecture et des travaux publics* 8, plate 46.

may be read as a way for Constant-Dufeux to register the ascendancy of structural form, it might have also served to highlight his own lineal trajectory as grandson of Soufflot's maître-appareilleur and former employee of Navier.

Most interesting in Constant-Dufeux's use of the parabolic arch is the way that he interwove the very new scientific relevance of the form within a symbolic logic that sought ultimate unity of meaning and form. Architects needed to reconcile what he termed *le fond et la forme* of a work. As Mérimée explained during the inaugural ceremonies, "on voit en lui une attention singulière à faire tendre tous les détails au même but" (Constant-Dufeux 1848, 446). This particular penchant for symbolic unity was a lifelong fixation for him, and if we are to believe Adolphe Lance's entry on Constant-Dufeux in *le Dictionnaire des architectes français*, one that severely stunted his professional career. But if he ever achieved this unity in a work, it was in this tomb, for one clearly reads it in the monolithic nature and roundedness of the cone sculpted from a single stone.¹⁰ Beyond this, Cousin had described the kind of unity Constant-Dufeux would attempt to achieve. For Cousin, the artist's charge was to find the hidden geometries in nature and make them transparent, overt. "[Le] fond est un peu couvert et voilé dans la nature." Cousin explained, "L'art le dégage, et lui donne des formes plus transparentes" (Cousin 1854, 177). The symbol for him was a particular kind of disclosure that allowed for correspondences between art, science and spirit to be made manifest. Constant-Dufeux's close friend César Daly reiterated much the same message in an article titled "La science et l'industrie, sont-elles les ennemies de l'art?" Architecture needed to correspond "à l'utile, au beau et au vrai, qui sont aussi trois aspects de l'unité universelle," he reminded his readers. Additionally, Daly explained that architecture was in essence mathematical and the architect's imaginative license "s'exerce toujours et nécessairement en parfait accord avec les mathématiques"¹¹ (Daly 1845, 54). The parabolic profile of Constant-Dufeux's tomb for the admiral d'Urville was chosen precisely because of its mathematical exactitude, and in order for that mathematical purity to be made manifest to the senses and experienced as beautiful and pleasing form.

An often overlooked facet of the 19th-century architect's concern with scientific rigour is the extent to which it was folded back into a symbolic and idealist logic. The parabolic profile of the tomb to Dumont d'Urville was but one instance in which the rationalism and "brute facts" of mathematical form were instilled with historical, aesthetic and moral resonance. Constant-Dufeux's monument was celebrated throughout the 19th century as one of the early statements in stone confronting the Neoclassical orthodoxy of the epoch. The parabolic arch would continue to be an evocative symbol of the 19th-century's reconciliation of art, science and spirit in the work of Constant-Dufeux's students. In the pages of the *Revue*, Daly published two student competition projects for a parish church in which parabolic arches replaced the pointed arches of the Gothic. Designed by François Dainville, the second of the two was particularly bold for the year of publication, 1847, as it was designed entirely of iron (Fig. 3). Additionally, Victor Ruprich-Robert would design a great many parabolic

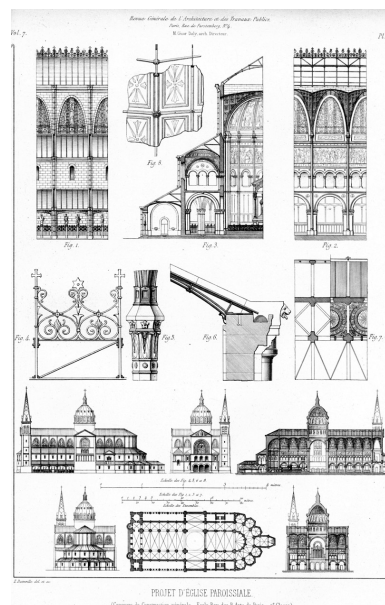


Fig. 3 : François Dainville, 1849. Projet d'Église Paroissiale. *Revue générale de l'architecture et des travaux publics* 8, plate 19.

arched monuments while in Constant-Dufeux's atelier and build some parabolic arched churches shortly thereafter (Fig. 4). The rise of parabolic arches in the more radical architectural circles of the time would be a contributing element in César Daly's historical analysis of form. By the late 1860s, Daly was making the case that the elliptical arch and its close cousins, the parabolic and the catenary, were the forms best expressing the spirit of modernity.¹² And perhaps Daly was right. Parabolic arches were frequent in the work of fin-de-siècle architects and popular well into the 20th-century with such structures as the hangars d'Orly by French engineer Eugène Freyssinet, and of course, Eero Saarinen's Gateway arch in Saint-Louis. And it is important to consider that there too they were used with symbolic purpose and as forms that best expressed the ideals of their time. In the early 1940s, Art Deco architect and streamlining advocate Walter Dorwin Teague voiced the modern attitude to the parabolic curve clearly. "We have the resources of line and color and form," Teague explained, "but we have no ornament." The parabolic curve with its "long backward sweep" would, he proclaimed, be the form

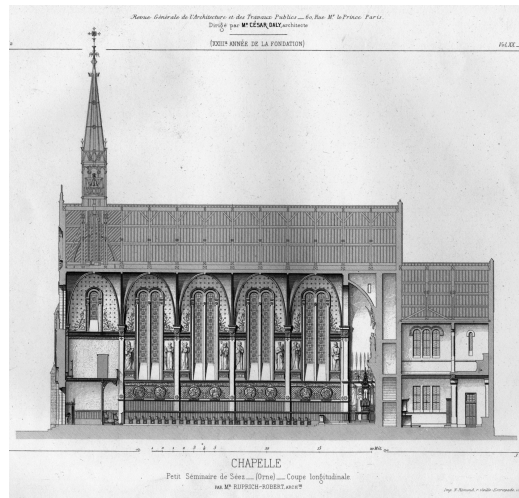


Fig. 4 : Victor Ruprich-Robert, 1862. La Chapelle du Petit Séminaire de Sées. *Revue générale de l'architecture et des travaux publics* 23, plate 30.

that best conveyed the temperament of the age: "we are a primitive age, a dynamic people, and we respond only to the expressions of tensions, of vigor, or energy."¹³

NOTES

1. The tomb has been fleetingly discussed by the following sources in the 20th-century: Hauteceur, L., 1955. *Histoire de l'architecture classique en France, tome vi*. Paris : Edition A. et J. Picard et Cie, 249-253; Sorel, P., 1991. Le monument funéraire de Dumont d'Urville (1790-1842). *Les appels d'Orphée* 3, 15-18 ; ETLIN, R.A., 1977. Landscapes of Eternity: Funerary Architecture and the Cemetery, 1793-1881. *Oppositions* 8, 13-31 ; le Normand, R.A., 1986. Tombeaux d'artistes. *Revue de l'art* 74 (74), 55-63.
2. Constant-Dufeux worked for the Ponts and Chaussées as conducteur non embrigadé until 1825. The Ponts et Chaussées was organized along strictly hierarchical lines. Each engineer had a number of conducteurs working under him. Conducteurs were ordered in two classes: embrigadé, or full-time members of the corps. Non-embrigadé, having the same responsibilities but were considered temporary workers and therefore had no salary deductions (retenue) but also no right to a retirement fund (retraite) (Baudrimont 1840, 166).
3. This, of course, was an unfortunate word choice because Cousin, who had been very direct in emphasizing the

disinterested nature of beauty, marginalized the utile in his theory. However, the way in which architects interpreted the word l'utile was very close to what Cousin termed convenance. Cousin believed the relation of part to whole was one of suitability (convenance) whereby each part had its proper and necessary place in the whole.

4. On 9 June 1840, a group of architects set up a commission made up of MM. Huyot as President and Blouet, Constant-Dufeux, Coussin, Durand, Garnaud, Gilbert, and A. Lenoir as Secretaries to study the possibility of setting up a corporation for licensing architectural practice. The Société Centrale des Architectes was officially founded three years later on 27 May 1843. The Bulletin Mensuel de la Société Centrale des Architectes begins each volume with images of the medal designed by Constant-Dufeux and the commemorative coin designed by Henri Labrousse as well as a short history of the Société.

5. Delauney would later write: « On ne peut discuter des goûts ni des couleurs ; mais que l'inconvenance des bigarrures, la crudité des tons, qui ne portent rien moins

qu'au recueillement, l'enluminure du portrait de l'amiral, et surtout l'élévation de ce cône disgracieux sur un soubassement plus sépulcral, ne l'aient pas chaque comme nous, nous ne le concevons pas » (Delaunay 1844, 389).

6. Constant-Dufeux explained how the polychromy of the monument contributed to its usefulness: « par utilité, nous n'entendons pas seulement la satisfaction des besoins matériels, mais aussi la satisfaction de besoins d'un ordre plus élevé, je veut dire ceux de l'intelligence ; et enfin l'utilité prise dans le sens élevé que je donne à ce mot, et qui conduit à la grandeur morale et au beau » (Constant-Dufeux 1848, 445).

7. In an article on the competition for the Chambre des députés, Constant Dufeux clarified the difference between the underlying principles, which, in his opinion, remained unchanged over time, and the historically contingent forms that ceaselessly modified themselves: « Ces principes gouvernent le fond, et non la forme qui se modifiera sans cesse dans l'avenir, comme elle s'est modifiée sans cesse dans le passé » (Dufeux, C. Grand Prix de l'institut : concours d'architecture, 299).

8. I owe this observation to my friend and colleague Cesare Birignani. See Blondel 1685.

9. In the obituary essay for the *Moniteur des architectes*, Franck Carlowicz remembered Constant-Dufeux's « merveilleuse aptitude à s'incarner pour ainsi dire dans le sujet proposé [...] C'est ce qu'il appelait, avec raison, « apposer son cachet. » (Carlowicz, F., 1870-1871. M. Constant-Dufeux. *Le Moniteur des architectes*, tome 5, 252.

10. « Pour lui conservé son caractère d'unité, nous lui avons donné la forme la plus simple, le contour le plus continu que nous ayant trouvé, en évitant les lignes décoratives qui auraient pu servir à dissimuler des joints, ou qui auraient fait soupçonner leur existence. Enfin, pour compléter d'unité que nous voulions accuser, nous l'avons peint d'un seul ton rouge plein et fort. Nous avons choisi de préférence, parce que de tous ceux de la palette il est le plus noble et le plus fier. » (Constant-Dufeux 1848, 443).

11. Daly 1845, 54.

12. See Van Zanten 1977

13. Teague 1940, 183

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