# NATURE'S OBJECTS: GEOLOGY, AESTHETICS, AND THE UNDERSTANDING OF MATERIALITY IN EIGHTEENTH-CENTURY BRITAIN AND FRANCE

by

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## ABSTRACT:

Explorations of aesthetic design and scientific experimentation have traditionally relied upon the natural world as a source of inspiration. Notably absent from previous studies of the eighteenth century is the dynamic connections between contrasting disciplines of this time period. Terrestrial objects such as diamonds, silver, gold, and stone, situated between architecture, the decorative arts, and geology, superseded classical models of Aristotelian emulation, which privileged original visual forms. They evoked newfound tensions between modalities of intuition and empirical observation, providing alternate paradigms of nature based upon firsthand experience. This dissertation takes up an extensive assembly of historical actors who analyzed these objects — architects, artisans, chemists, collectors, engravers, geologists, jewelers, and silversmiths. Late Enlightenment designers Robert Adam, William Chambers, and Batty Langley as well as intellectuals Denis Diderot and Louis Dutens explored some of the same materials that piqued the curiosity of silversmiths Pierre-Simon Augustin Dupré, François-Thomas Germain, and Jacques Röettiers. Artisan Pierre de Fontanieu and chemists Antoine Laurent de Lavoisier and Jean-Louis Baptiste Romé de l'Isle also problematized the aesthetic usages of these objects, arriving at differing conclusions. Pervasive debates throughout Europe attempted to determine the quotient of hardness in minerals, plasticity of metal, or durability of stone. These provocative cross-currents between the domains of the arts, sciences, and politics generated remarkable insight into these objects taken from the earth; in turn, these intersections shaped a unique conception of materiality, which anticipated untapped potential for architectural styles, artistic production, and geological determination.

Mining and related images of the subterranean — mineralogical atlases, etchings of rock formations, maps of sedimentary deposits, imagined grottos, and utopian architecture — are framed as part of a geological imaginary, a contributor to modernism's early inheritance. The first chapter contemplates how the cutting of diamonds as raw stones cultivated attitudes towards jewelry settings, formulas for false gemstones, and chemical demonstrations. Artisans judged a diamond's functional and authentic attributes in order to craft acceptable imitations. In focusing upon silver and gold, the second chapter traces the material transformations of valuable metals from decorative ornament into commemorative coins and medals during the French Revolution. Fiscal currency circulated as economic signifiers that embodied human

values superimposed onto natural resources. The third chapter examines several types of stone from limestone, granite, to marble demonstrating how their visual and structural properties became articulated through Gothic revival practices in Georgian England. Antiquarian and genealogical discourses not only influenced conceptions of stone as a building material, but they also focused upon geological explanations as a mutual foundation of comprehension. The conclusion merges the mythological stories behind these objects with their historical narratives, elucidating why cultural misinterpretations are as important as factual evidence. Derived from corporeal perception and abstract theorization, materiality revealed unknown dimensions of these prosaic objects, whose telluric origins became recast as both ancient and modern.

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## Introduction: Mining's Proto-Modern History and its Subterranean Manifestations

I consider nature a vast chemical laboratory in which all kinds of composition and decompositions are formed.

- Antoine-Laurent Lavoisier (1743-1794)

Eighteenth-century conceptions of earth — of dirt, gravel, the ground, the subsoil — included more than Lavoisier's view of nature as a "vast chemical laboratory." The early scientist's claim to nature was inevitably moored to Enlightenment dreams of agricultural possibility, visions of natural bounty, and a cultural imaginary that inscribed the geological underground with a religiously-inflected fear of darkness.[1] The act of mining, an onerous practice of reaping valuable substances from the land, encompassed many dimensions of the subterranean; it referred to the bureaucratic management of a territory's resources, the symbolic power held by monarchs, and raw materials that would later be transformed into industrial commodities. Mining, common among manufacturing trades as well as the burgeoning earth sciences of geography, geology, metallurgy, and mineralogy, not only exposed crystalline minerals and effulgent gems for human consumption, but it also embraced other natural elements such as mountains, which challenged man's comprehension through the complexity of their imposing scale.

In order to comprehend visual images related to the earth, we must first briefly revisit Georgius Agricola's renowned treatise *De re metallica* (1556), which set out many of the cultural and social dimensions associated with mining during the early modern era. Agricola had long extolled its beneficial virtues, providing credence and moral justification to what had formerly been perceived as a menial task of labor. He countered ethical objections to mining, considered a mutilation of sacred ground, by advocating for

the mastery of the earth and its organisms.[2] A miner had to know which mountain or hill, for instance, was to be prospected, or which areas were to be left alone; from the aggregate veins found in rocks to the external characteristics of gems and marbles, he was required to possess a methodical knowledge of technical apparatus that were needed for extracting metallic ores. The discipline of philosophy was indispensable to diagnose the cause, origin, and character of subterranean operations. Surveying skills were employed to determine how deep a shaft should be to reach a tunnel, along with other specialties such as arithmetical science to calculate the cost of working expenses and architectural design to construct contraptions for quarrying and dirt removal. Miners were encouraged to use drawing in order to visualize machinery plans as well as the practice of the law so that he was able to claim his own rights in regards to these metallic resources. Abraham Gottlob Werner, who had studied the external characteristics of minerals found in the Harz mountains, taught his students at the Freiburg Mining Academy that all rocks were composed of sediment or precipitate in a universal ocean. From Freiburg to Altenburg, the terrain situated below these territories, envisioned by early scientists such as Werner, possessed prosperous metals for their Saxon titleholders, stowing away greater wealth than was "apparent and visible above ground."[3] The fields of medicine and astronomy were also beneficial in the visualization of natural objects that lay embedded within the earth; mining's practical forays into heterogeneous disciplines exhibited greater flexibility that transcended the mundane siting of submerged passageways.

Eighteenth-century European savants, in expanding their intellectual ambitions, sought to reveal the causal processes behind the visual forms of landscape offered to the naked eye. *Dessein de savoir*, noted by historian Daniel Roche, permeated the earth

sciences at a time when the professional boundaries of geology during the 1780s and 1820s had not been clearly distinguished.[4] Under the auspices of geology, mining was not only part of this insatiable desire to apprehend the natural world but also appeared as the predominant subject of many chemical, mineralogical, and political treatises. First sightings of natural resources were intimately connected to the right of ownership. A miner's freedom in Germany (*Bergbaufreiheit*), for example, allowed a man to prospect a claim and then hold it against any other parties until it was abandoned. In Great Britain, Sir William Blackstone in his "Commentaries on the Laws of England" (1765) enumerated that copper, tin, iron, or lead mines were not considered royal resources; it was, however, possible for a sovereign to extract the ore from the mines by paying a fiscal amount assigned to the base metal, rightfully given back to the landowner.[5]

Savant administrators, Emma Spary remarks, experimented with the relations between the natural and the social on a daily basis, using their knowledge of the "operations of natural economy" to frame an understanding of revolutionary government.[6] Antoine-Grimoald Monnet (1734-1817), in the opening lines of his historical memoir on the mines of France (1790), boldly declared that it was the divine right of a sovereign to claim the precious metals embedded in the ground; as epitomized in many states in Europe, as a position of public point, he attested that "the sovereign is the master of all that is below, a conservator of public riches, and that mines should be governed on his part, as the waters and forests."[7] As a royal inspector of mines in 1776, Monnet employed his scientific expertise as a geologist to determine the socio-economic values of the state's natural resources and to theorize the extant relationships between outlying mineral veins and neighboring mountains. In referring to trees, bodies of water,

and the soil itself, Monnet's advocacy of France's ecological abundance reflected a profound sensitivity towards divinely ordered reserves and the human agency to utilize their receptive attributes for a range of national purposes.

Advancements in French industrial areas such as mining were not competitive with techniques being invented in other proximate European countries. Minister of the Interior Jean-Antoine Chaptal, whose experiments with sulfuric acid and bleaching engendered pragmatic implications for industrial chemistry during Napoleon I's reign, was well-aware of France's "technological inferiority" to Great Britain; in fact, many French practitioners of science were solely focused on acquiring theoretical knowledge that possessed little or no mechanical application or the potential for mass dissemination in the public realm.[8]

For geologists of the 1780s, the Earth itself was treated as a general object of theory as well as a target of scientific practice, a field of study that would later become known as geotectonics. British and French geologists both sought to answer two primary questions — a historical question that demanded if geology as a discipline should outline the development of the earth from its earliest beginnings to its present state, and a causal question that determined if geology would be able to identify the processes generating the earth's structure. The causal approach to geology determined the physics of given mechanisms while the historical approach to geology exploited local examples to determine when and how events occurred. With the onset of the nineteenth century, most geologists had merged these two approaches in practice, incorporating causal explanations with a historical dimension and employing local, contingent observations to explain what happened in the past. Ongoing geological research, such as stratigraphy,

was typically shared between France and England during the fruitful period of the 1820s and 1830s. In a period where Alexander von Humboldt had published his essay on French geonosy, William Conybeare and William Phillips had simultaneously compiled their own large-scale survey on British formations entitled *Outlines of the Geology of England and Wales* (1822).[9]

With the increased proliferation of theories on stratigraphy, fossil discoveries, and the earth's composition, geologists struggle to evaluate which assumptions were the most accurate in determining the creation of natural formations. Scientific intellectuals habitually battled a misinformed public who assumed that the biblical deluge was a recent phenomenon responsible for the excavation of valleys and deposition of soil debris. In the nineteenth century, William Buckland, who had been partially criticized for his strain of scriptural geology in 1822, struggled to make diluvial theory compatible with concurrent findings such as the Kirkdale cave fossils in Yorkshire, a notion that was often repudiated by the "scientific elite" as a mode of Genesis literalism. As paleontologist Stephen Jay Gould maintained, even the expansive theories of change in geology as represented by well-known experts such as James Hutton and Charles Lyell were predominantly guided by visionary desires that eventually gained empirical support afterwards.[10]

**Imagining what lies beneath**

Enduring forms of fascination with the natural world are rooted profoundly in the debates and practices of early modern Europe, as historian of science Alix Cooper has insisted. Local knowledge was cultivated by examining "indigenous" things, at home and

abroad, evoking pressing questions about natural origins, identity, and geography.[11] In this sense, this dissertation is an examination of the local empirical and subjective perceptions of individual actors. Simultaneously, it also attempts to reconstruct the broader cultural, philosophical, and scientific conditions that circumscribed these distinctive objects appropriated from the earth. Moving towards the plurality of bodies of knowledge that are inscribed within the subterranean, I offer the reader a panoply of visual images that evoke diverse aspects of the underground, which necessitate closer examination.

Cartographic representations such as the sixteen mineralogical maps commissioned by Minister Henri Bertin and created by Jean-Etienne Guettard (1715-1786) and his partner Monnet (1734-1817), attempted to document stratigraphic layers of rock, using a newly devised shorthand system of small inked boxes or diamonds.[12] Guettard was one of the first early scientists to represent subsurface materials on geographical documents, demarcating that the resources located underground were as significant as the terrestrial formations above ground. Both collaborators were preoccupied with "the manner of being in the earth" and "the composition of the globe we inhabit." Rhoda Rappaport has noted that their efforts at verifying the locations of mineralogical deposits paralleled similar endeavors by naturalist Antonio Vallisneri (1661-1730) and philosophe Baron d'Holbach (1723-1789).[13] **(Fig. 0.1)** In two technical drawings of the map of the Picardy regions of Calais and Dunkerque, the ground is carefully divided into meticulous sub-sections where Tuf shells and fossils may be located; on the right, the section indicates how layers of Terques marble are positioned at forty-five degree angle in the north. Not only did these renderings depict hypothetical

structures of terrain, but they also presented a highly regularized hierarchy that visually connected rocks, river embankments, and the greater geography of France to prescribed laws that could be measured, drawn, and documented. In another drawing of the sectional profile of the Picardy and Champagne region, stratigraphic colored layers are highly stylized in their appearance, conveying general information about each type of rock and what could be found in each layer, emphasizing universal designation over specific details.

Monnet propounded in his *Exposition of Mines* (1772) that precious metals such as gold, silver, and iron drew their designated qualities from their surrounding environs in which they were discovered, and inevitably, ordained the type of mine that could be set up at a given locality. Mining required the gathering of local information from immediate sites and the primary separation of minerals and metals from the rocks in which they were embedded; he averred that the preparation and design of a mine directly influenced its productivity: "If nature ever showed us the massive mines or mass continued in the vein, the preparation for casting is not difficult, and would not require much skill," he professed, "it would, if they were crushed dry or broken into small enough pieces, depending on their nature, but more often they are scattered here & there in the rock or gangue of the veins, and sometimes so thinly, one can not perceive them. It is particularly in the latter case necessity must be used throughout the industry & the art in order for Mineralogists to obtain the most advantage and profit possible..."[14] Smelting furnaces and related equipment were also compulsory for the success of such an operation, and the direction of mines, closely joined to the refining processes that prepared raw materials for

finished artistic products, typified how geological understanding affected the inception of nascent mining infrastructure and its consequential economic rewards.[15]

Barthélemy Faujas de Saint-Fond (1741-1819), akin to his fellow geologists, recorded the topographical surfaces of mountains such as St. Pierre near Maastricht in the Netherlands. No less methodical than Guettard or Monnet, he had preferred this particular area since it was rich in fossils, including the skull of a mosasaurus, and described the length of the interior "galleries" within the mountain as one hundred and nine feet in length approximately with a height of forty-four feet. **(Fig 0.2)** Noting the "rustic dwelling" within one of the fissures which either housed a fairy or a caretaker of the "profound catacombs," he recounted that the walls, "fabricated from the hands of nature, offer varied masses of a very prickly effect; and light, which arrives here through an exterior opening, produces a soft clarity, which pleases the eye and emphasizes in the same terms all of the effects of this ancient cavern."[16] His etchings provoked educated antiquarians to become more aware of the natural causes that triggered these formations. **(Fig 0.3)** In an illustration of Rocher du Mallias, produced for his treatise on the dormant volcanoes and ruins in the two French provinces of Vivarais and Velay, groups of massive columns of basalt rock are lodged underneath within the interior of a larger volcanic mass, and two men, who are conversing between themselves, seem to be discussing the origins of the basalt that lies before them. Contrasted with the colossal pillars looming above them, the men seem diminutive and inconsequential. **(Fig. 0.4)** In another image of "the paving stones of giants" at Chenavari, towering columns of basalt almost sixty-five meters high became a forest upholding the top plateau near Rochemaure. According to historian of science David Aubin, mountains embodied "sites

of experimentation" referring to Geneva physicist Horace-Bénédict de Saussure's vested interests in the Alps. Artificial spaces of the laboratory were no substitution for real alpine conditions, where scientists could experience the veritable feeling of being in the open air.[17]

Nonetheless, while mountains epitomized sublime paradoxes for Faujas de Saint-Fond, nature became highly rationalized for architects such as Etienne-Louis Boullée (1728-1799) at the height of the Neoclassical moment in France. In seeking to discover the internal essences of bodies, their properties, and analogies of organization, Boullée discussed in *Architecture, essai sur l'art* (1790s) the pure character of natural forms and his cognitive impressions of physical masses, whose surfaces were convex, concave, angular, or planimetric. He recognized that the proportions of these forms arose from their assembled features of regularity, symmetry, and variety. "But the measure of the impressions that we feel from the sight of objects is in light of their evidence, which made us distinguish particularly regular bodies, it is their regularity and symmetry which are the image of order and that image is the evidence in itself," he stated, "of these observations. It results that men could only have clear ideas of the figure of bodies after having had that of regularity."[18]

**(Fig. 0.5)** His *Cenotaph dans le genre égyptian* (1781-1793) depicted a pyramidal monument, situated within a bleak, arid desert with windswept ominous clouds lingering above the geometric edges of the building capped by a small pediment opening on each side. The immutable, silent landscape is barely present, only as a necessary horizon line to indicate where the pyramid rests; here the ground is conveyed as an uniform canvas, providing a stark sterility to a terrain that has become as rationalized as the building

itself. Boullée alluded to geometric spheres, cubes, and pyramids as possible utopian forms, but the reassuring certitude offered by the numerous faces of regular bodies secreted in nature, one could believe, was reflected as well in the sensible, recurring forms of minerals, rocks, mountains, and volcanoes investigated by geologists.[19]

Motifs of Freemasonic temples are arrayed within Jean-Jacques Lequeu's (1757-1826) *Gothic House* that envisioned a course with trials by fire, water, earth, and air, perhaps sourced from Abbé Jean Terrasson's (1670-1750) novel *Sethos* (1731). Lequeu imagined the quotidian landscape to embody surrealist fantasy, heightened sensuality, and a shadowy unconscious that lurked below the prevailing streams of Enlightenment reason. Admitted to the Académie d'Architecture and appointed to work in the office of Jacques-Germain Soufflot, the architect of the Pantheon, Lequeu demonstrated a gifted flair for drawing; none of his buildings, however, have survived into the present day, including a country house called the Temple of Silence. Despite this absence, he left behind a rich trove of renderings that expressed his vivid conceptions of the earth's spectral disposition and of human temperament that extended into the details of his architectural designs. Lequeu's *l'Architecture Civile* (1777-1826) even specified the type of stone — its finish, strength, and durability — for designated types of buildings colored for each one, for example, in mood-inducing tones.

**(Fig. 0.6)** We are furnished, in his *La merveilleuse grotte de océanitides à trois étage* (1777-1814), with a rock-like cavern containing tri-partite levels of flowing fountains that rapidly fall from an upper story with three distinct openings to a lower level, surrounding a smaller conventional fountain in a plaza.[20] Lequeu's designs of underworld grottos were paraded alongside visibly lit interiors that disgorged flame

torrents, rooms filled with melted wax, or grotesque statues capped with the heads of carnal beasts. He framed the subterranean as a site populated by the cult of the dead and unconscious desires, where rationality was pitted against imagination. His versatile usage of the sectional cut, a similar method developed by geologists to render a sample of a terrain's compacted layers, was freely utilized, serving occasionally as a dividing mechanism and a method to add dimensional depth to pen ink/wash drawings.

**(Fig. 0.7)** In the *Coupe de la petite grotte du souterraine* designed within the interior of an apartment, for instance, the sectional cut, uneven and irregular in places, situates a grotto within a staircase, replete with what appear to be natural-looking stalactites hanging from the ceiling with rippled and organic stone walls with a flat fountain base placed at its center.[21] The interiorized grotto emulates an artificial landscape within the seemingly conventional confines of the building that acted as an externalized space of psychological containment. **(Fig. 0.8)** Elements of nature have also made their way into a sketch of a winter garden that curiously assumes the form of a building section. With a temple dedicated to Apollo, the garden as building strangely transitions into an atrium filled with foliage and greenery sprouting from the floor. The floor is marked simply as "terra"; the ceiling is scored with the French word "ciel" or sky. Between earth and the heavens, Lequeu creates a self-enclosed microcosm within the realm of insulated habitation, which belonged to natural life and artificial construction.

Referring to human physiognomy, the sacred grove, and the theater as ciphers of new incipient origins, these anthropomorphic studies of appearances conduct the spectator back to a new point in time, which seemed to defy conventional traditions. Lequeu introduced a recursive mode of historical discontinuity through his allegorical

inventions, invoking a time before antiquity and the Enlightenment. Through the disintegration of the conventional architectural section, he seemed to nullify the formal presence of the building, leaving it devoid of any symbolic content. Lequeu shaped architectural representation in the service of a geological imaginary, which operates as image, metaphor, and historical reference all at once. Architecture, as man's art of shelter, encapsulated the savagery of the landscape, inverting conditions of interiority into exteriority and channeling the underground back into conscious awareness through representation.

Instead of sequestering Lequeu as an individual whose designs have been classified as grotesque or merely fanciful, his works suggest a provocative orientation that points to a geological imaginary prevalent among many areas of philosophical thought. This imaginary, which included cultural, social and technological concepts associated with the underground and the science of geology, became evident in Lequeu's projects. His designs persist in defying conventional categorization, notwithstanding the substantial amount of scholarship that has been devoted to fathoming his techniques and visual motifs. Tropes of classical proportion or even of recognizable landscape play no part in his mystical, if not surreal, interpretations of architecture. The manner of "being in the earth," for Lequeu, can be viewed as foreshadowing a psychological state that conveys the past into the future. It is, in fact, this return to a primal state of awareness that transgresses aesthetic, civic, political, and religious realms, which is at the crux of his images.

**Post-Aristotelian models of nature**

From the excavations of archaeological sites, antiquarian rock formations, to mineralogical gemstones secreted within the earth's recesses, the steadfast pursuit of the natural world during the eighteenth century redefined how artistic and scientific disciplines were allied to one another, where the cultural, institutional, and historical aspects of these fields of study were far more mutable than we have previously assumed. Discarding older Aristotelian notions of nature as an ideal and the work of art as mere imitation, architects, artisans, and geologists called into question the presumed stability of epistemological limits by speculating on the attributes of metals, minerals, and rocks found in the landscape. Imbricated with systematic meaning and possibility, visual characteristics of the landscape were rendered into hand-drawn line sketches of mountainous profiles, watercolor drawings of crystals, printed studies of mining facilities, and etchings of volcanoes located in Europe and other continents. Richard Payne Knight (1750-1824), a polymath and member of the Society of Dilettanti, for instance, documented his 1767 Sicilian expedition by capturing his itinerary in a detailed journal along with finished watercolors of volcanic vignettes and archaeological entries that would lend themselves to engraving.[22] These translated elements of a "pictorial language" communicated sensory impressions, subjective conjectures about the places/forms depicted, and their hierarchical status within larger geological systems.

Such graphic representations did not merely emulate nature but were considered valid alternate models of nature that attempted to discern the unseen laws of the environment by harnessing local observations to visual information, to explore the chemical composition of quartz, interior caverns of Mont Blanc, staging for state mines,

and atmospheric scenery employed as the backdrop for utopian architectural designs. As Barbara Maria Stafford has indicated, the syncretic attitudes of savants and their "conscious rejection of certain established mental constructions," are emblematic of the greater Enlightenment conflict to reveal the essential truth(s) of physical phenomena "without imprisoning it in self-revelatory idiosyncrasy." Individual experience, accordingly, was faithfully combined with universal interpretations, casting the prehistoric and primitive tangibility of gems, metals, minerals, and mountains into "...heroic substances that had suffered the vicissitudes of the earth's evolution and now nobly wore the marks and traces of terrestrial 'passions'."[23]

The historical narrative of how natural resources have been extracted from the ground and exploited for human purposes is a long-standing, if not timeworn, theme. Yet, what remains on the underside of this account is the complex process by which natural objects were apprehended for their true "character" and furthermore, how they became acculturated into disciplinary discourses. Science and industry, which have claimed these objects for their inherent economic value, have obscured the increasingly tenuous boundaries between natural attributes and human enterprise. The earth emerged not only as a particular object of study for those in the geological sciences, but it also erupted within the historical consciousness of individuals as a repository of physical manifestations, which demanded acumen for elucidating their theoretical meaning and practical applications. Scottish geologist James Hutton's 1788 conception of "deep time" still reverberates through other epistemological domains such as architecture and the decorative arts.[24] The ancient origins of these terrestrial objects remained a point of reference throughout aesthetic, material, philosophical, and technical developments that

were prevalent in the design of a building or the fabrication of an intimate piece of jewelry. These interpretations of a terrestrial object's natural state, ranging from its observable attributes to visual impressions, revealed a mode of truth to the individual perceiving the object. The learned percipience of historical actors discussed in this thesis unveiled the earth's primitive condition and its imminent embodiments that lay beyond the trappings of its fundamental splendor. Mining does not attend so much to the questions raised by the history of science or intellectual history but emerges as a significant issue that gauges a fluctuating social and political landscape of the eighteenth century. These proto-modern images allow us a partial view into mining's history through the collection (and re-assembly) of these terrestrial objects that merged practical functions with theoretical import, material concerns with intuitive impressions.

Against this expansive background, this dissertation reconciles these pervasive objects, images, and texts that existed in architecture, the decorative arts, and the geological sciences, in order to elucidate their visual and theoretical connections that galvanized discursive interests in the earth, its formations, and materials. It includes an extensive group of historical actors — from architects, artisans, collectors, engravers, geologists, to jewelers, experts in mineralogy, and silversmiths — who problematized the aesthetic usages of terrestrial materials in quotidian items such as coins, rings, necklaces, tureens, as well as building facades, streets, and landscape views. They attempted to judge their utility as pertinent evidence and their theoretical yet also practical capacity for aesthetic motifs, scientific work, and industrial applications. The physical properties of these objects were the solution for many epistemological debates that attempted to determine qualities of hardness in minerals, plasticity in metal, or the durability of stone.

Rudolf Wittkower professed that many eighteenth-century writers on art lifted convenient portions from Aristotle's *Poetics*, which stated artists (and artisans) should copy natural things "either as they were or are" and "as they ought to be."[25] Called pseudo-Aristotelian by Wittkower, this approach was based upon employing select models of nature — epitomes of real nature — for imitation in the visual arts.

I ask how the dispersion of eighteenth-century geological theories was pertinent for a modern understanding of architecture, art, and design? Can the decorative arts be repositioned in relation to architecture through an analysis of visual influences and technical labor in order to comprehend the shared visual representations common to both fields? How did geologists, architects, and artisans engage the discipline of history, a related consequence of the Enlightenment, in order to understand the purposes behind scientific and aesthetic objects? Approaches from art history and methodologies in the history of the science are united in order to elucidate how these contested objects shaped a unique comprehension of materiality that ranged from concrete observations to intuitive presumptions of their anticipated potential for varied techniques in architectural styles, artistic production, and geological determination.

The first chapter contemplates how interpretations of hardness, clarity, color, and form in diamonds affected artistic conceptions of precious stones, and reciprocally, how these same visual attributes became prevalent in scientific demonstrations. Louis Dutens, Pierre Elisabeth de Fontanieu, David Jeffries, Jean-Baptiste Romé de l'Isle, Antoine-Laurent Lavoisier, and Gabriel Rouelle simulated and tested gemstones for the fashioning of necklaces, bracelets, and rings as well as trials for organic experiments.[26] Diamonds,

prevalent in the fields of early chemistry, fine arts, and jewelry-making, marshaled historical trepidations about authenticity and utility to probe the limits of natural artifice.

Linking together two related modes of artistic production, the second chapter traces how the melting of silver and gold found in decorative ornament became transformed into monetary currency from the end of the Seven Years' War to the French Revolution. It centers upon the ability of precious metals to embody changing perceptions of the sovereign state and to accrue heterogeneous historical connotations through altered states of exchange over time.[27] Extending Juste-Aurèle Meissonier's life-casting techniques, silversmiths such as Francois-Thomas Germain and Jacques Röettiers developed changing methods of creating new vegetal and fluid forms for serving platters, as well as engravers like Pierre-Simon Benjamin Duvivier and Augustin Dupré, who imprinted portraits onto medals from metallic alloys with themes of civil buildings and egalitarian liberty.

The third chapter examines assorted types of stone from limestone, granite, flint, and marble, and their engagement with concepts of genealogy and antiquarianism as manifested throughout Georgian architectural practices in Great Britain. Many of stone's primeval attributes became adopted and subsumed into building and construction techniques that articulated its natural composition, structure, and geographic locality. The Gothic revival style, as evidenced in the designs of villas, pavilions, and grottos, reintroduced "geological ruins," attempting to employ architectural design to mimic natural formations. In the conclusion, cultural mythologies and historical narratives surrounding these terrestrial objects during the eighteenth century generated a broad concept of materiality, which emerged through firsthand experiences of historical actors

and their familiarity with these objects' physical attributes. This incorporation of direct effects, unknown forces, and subjective interpretations assumed by these historical actors, as I propose, reiterated key principles of material agency through the corporeal understanding of man-made objects, whose processes of formation were transformed and if you will, reinforced by later nineteenth-century attitudes towards nature.

By focusing on scientific conceptions of nature during the eighteenth century, I follow how geologists, architects, and artisans analyzed these common objects of study, and how artistic styles captured nature through techniques of design in Great Britain and France. The profound ambivalence noted by these historical actors themselves towards their own choices of methodologies informed their outlining of visual imagery. Self-aware choices exhibited by historical figures such as Monnet, subjective assumptions, and the historical contingencies associated with these natural objects bear the hallmarks of what I consider modern reasoning. In tracing how an object such as a diamond was shared among lapidaries, jewelers, and chemists as a fascinating interest of curiosity, this study demonstrates a number of ways that these terrestrial objects traversed from one field of study to another, slicing across demarcations between the grand categories of "nature" and "artifice" as well as those of aesthetics and science. Objects such as silver and gold endured catalytic transformations of state that emphasized their fungibility as materials of transmission, making their economic value ever more pronounced. They were transferred between individuals as a means of exchange but also through techniques in architecture, decorative art, and geology, they became artistic endeavors. An object of authentic experience, implied by Susan Stewart, could be distinguished from others by the "lived" involvement of its maker and the "second-hand" experience of its possessor.[28]

Geology and architecture shared stone as a common material; architects familiar with the innate knowledge of stone's composition dictated the effects of Georgian building practices while redefining the lore of English genealogy and identity. The proliferation of technical innovations created by artisans, architects, and geologists —the brilliant cut for diamonds, molding techniques for an optimal temperature of melting silver, the transportation of stone down canal waterways in Bath, or the measurements of the mountain peaks in the Alps — were early indications that modern perceptions had taken hold during the eighteenth century. Geology's relationship to landscape painting, literature, and poetry is not of interest here; what types and how natural objects were represented is, however, a common thread that binds my project to the efforts of scholars such as Rebecca Bedell, Noah Heringman, and Marcia Pointon, who have respectively written on the picturesque sublime, Romantic notions of rocks, or the semantic meaning of precious stones.[29] Quotidian objects such as rocks emerged within pervasive intellectual debates that stretched across the arts and sciences but also exemplified extraordinary behaviors that continued beyond their mundane exteriors.

All of these images of the subterranean — mineralogical atlases, etchings of rock formations viewed as leisure destinations, sectional drawings of mine shafts, the structural composition of the soil, fictional grottos, and monumental architectural typologies — exemplified crucial manifestations that evoked historical contingencies testing the supposed limits of man's knowledge.[30] The landscape presented terrestrial objects that were documented, analyzed, and ultimately disseminated into architectural styles, artistic productions, and geological theories. In this present moment, they speak to us of their complex historical lineages that allowed for a profuse diffusion of aesthetic

associations, ideas, and paradigms. These telluric objects, however, remain imperfect figments that only gesture towards answers being unveiled, implying that a single impression may yield a complete picture still in the making.

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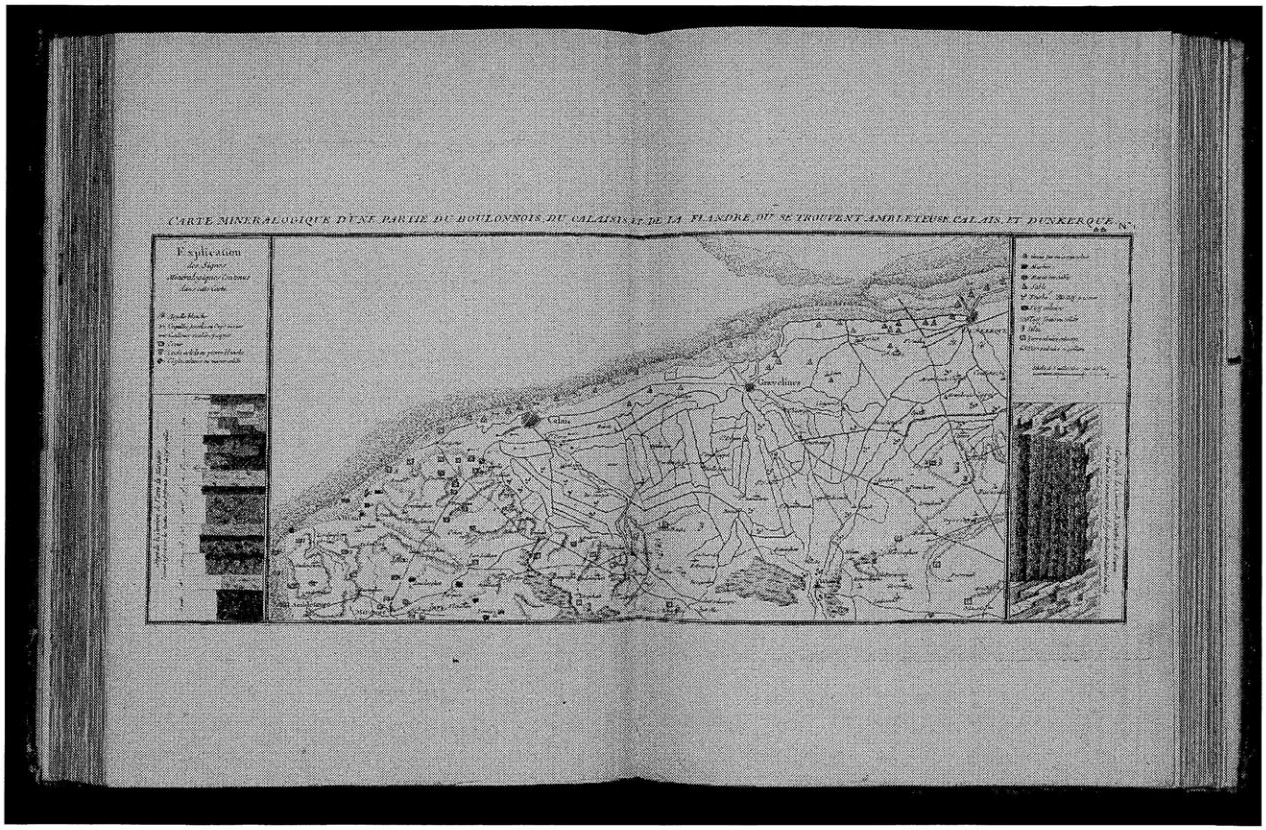
**Illustrations**

Fig. 0.1: Jean-Etienne Guettard and Antoine Monnet, *Atlas et descriptions minéralogiques de la France, entrepris par ordre du Roi...*(1780)



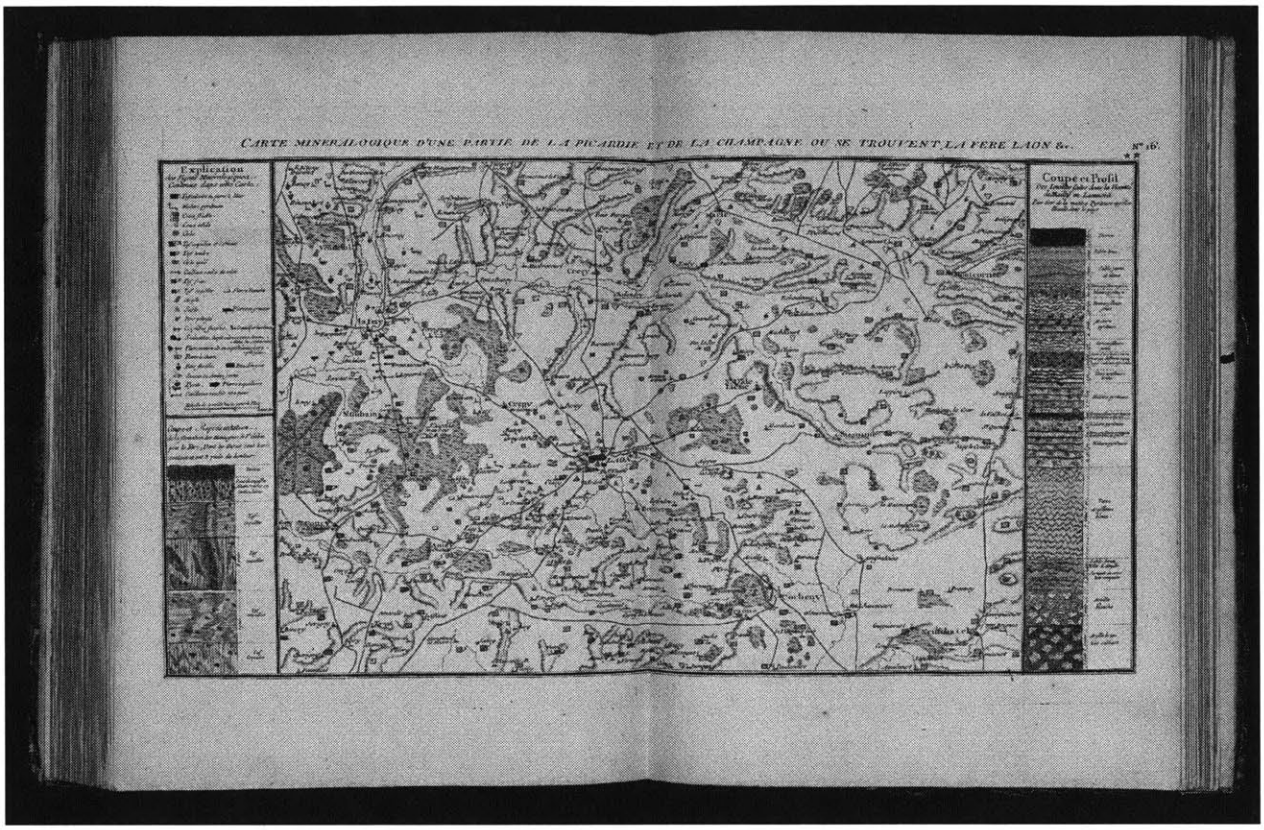



Fig. 0.2: Barthélemy Faujas de Saint-Fond, *Histoire naturelle de la montagne de Saint-Pierre de Maestricht* (1798), Mosasaurus skull

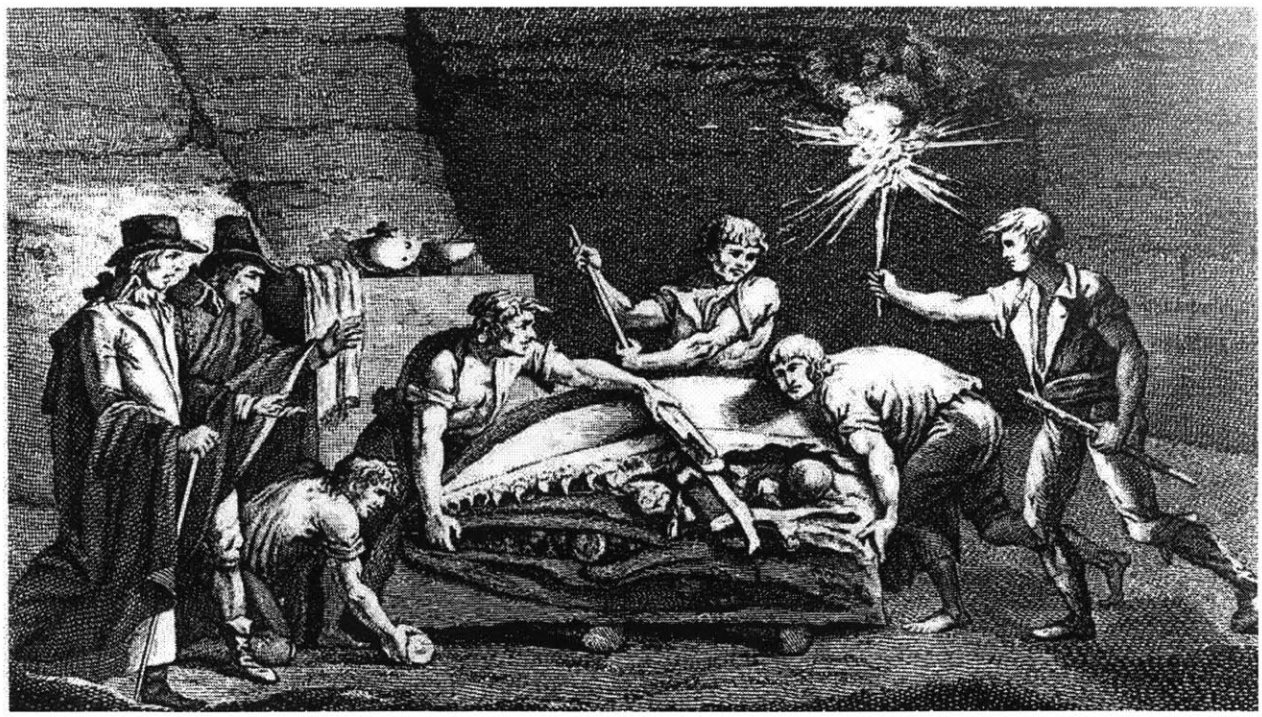
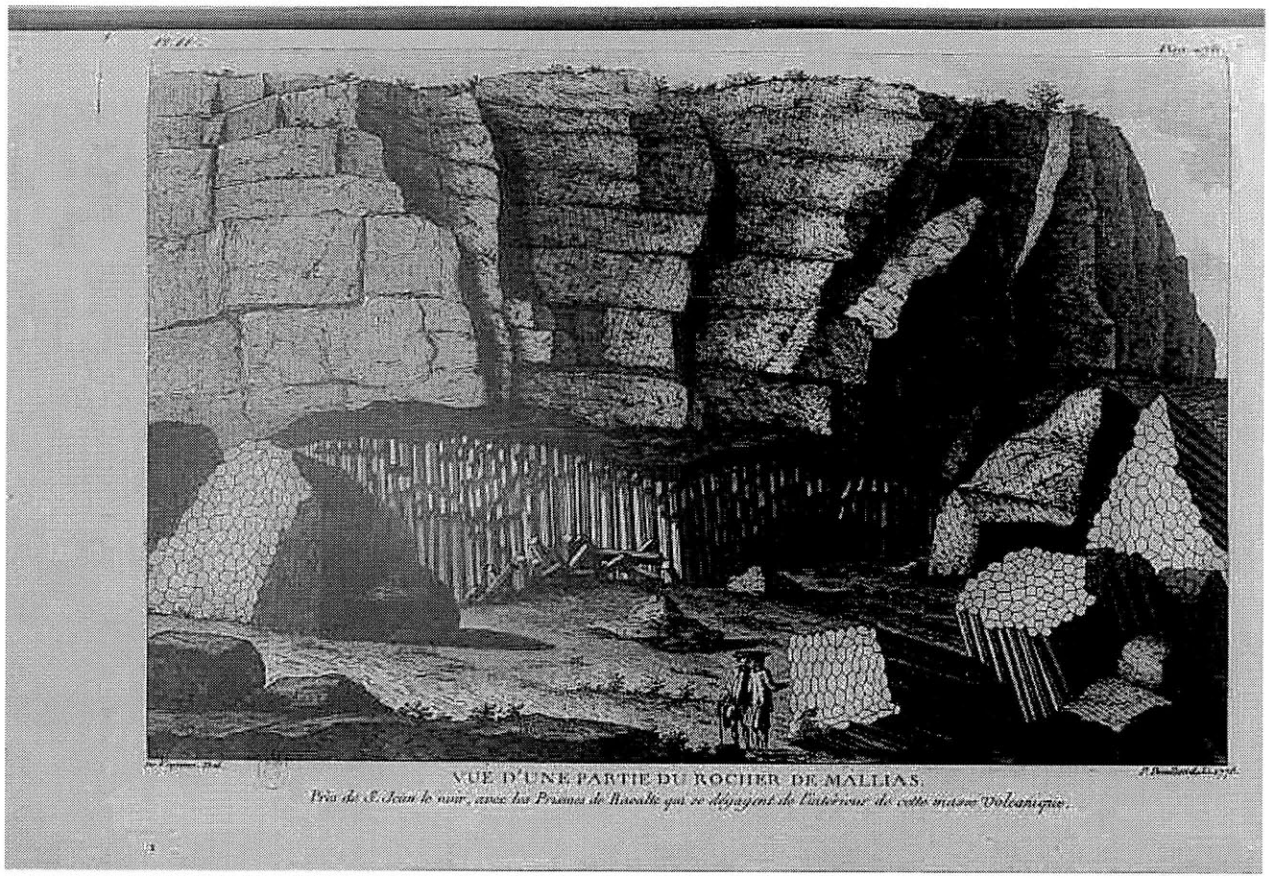


Fig. 0.3: Faujas de Saint-Fond, *Histoire naturelle de la montagne de Saint-Pierre de Maestricht* (1798), Expailly, Rocher du Mallias, and Rochemaure



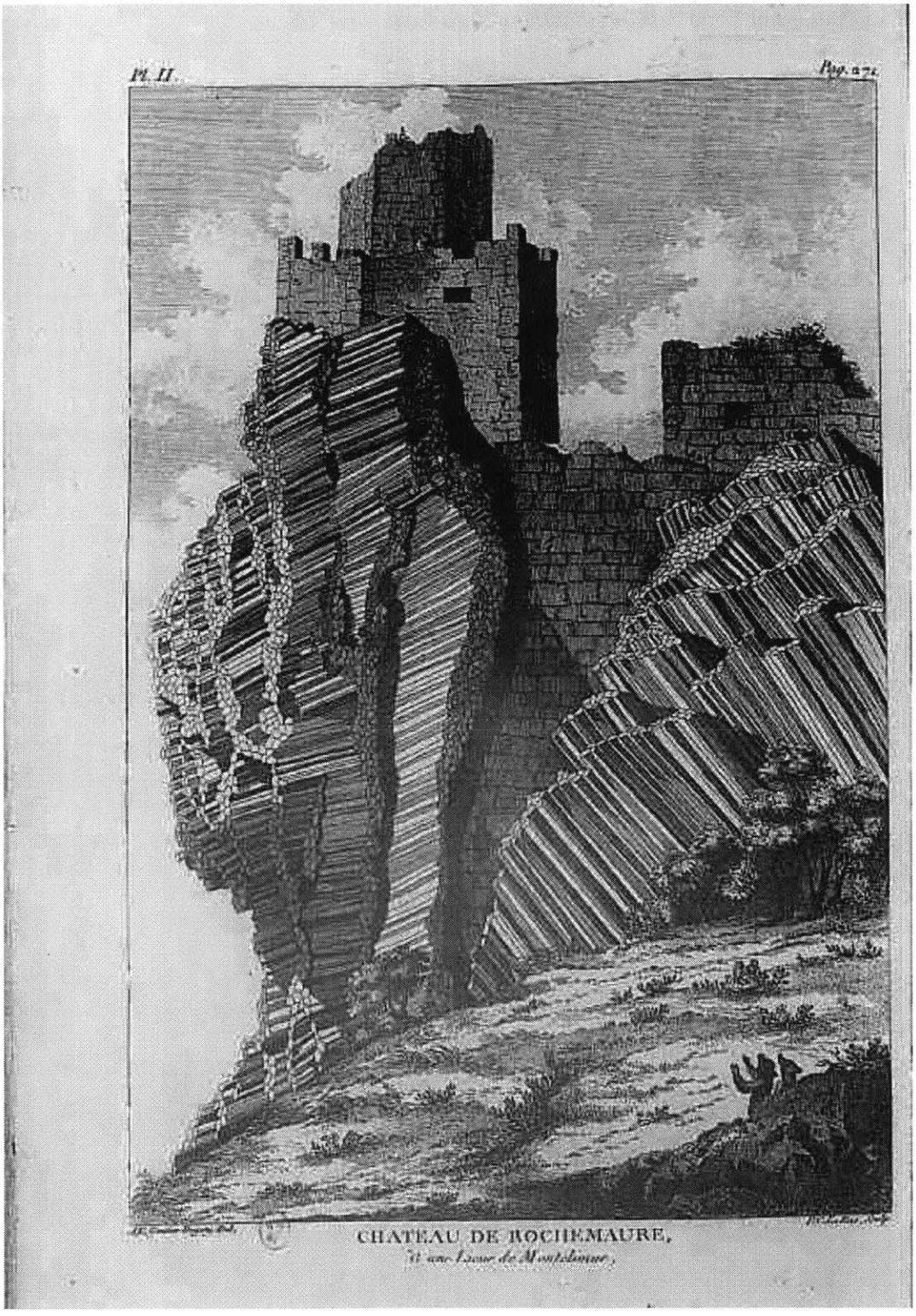

Pl. II.
Pag. 272.
CHATEAU DE ROCHEMAURE,
A une Lieue de Montélimart.

Fig. 0.4: Faujas de Saint-Fond, *Histoire naturelle de la montagne de Saint-Pierre de Maestricht* (1798), Chenavari and Expailly

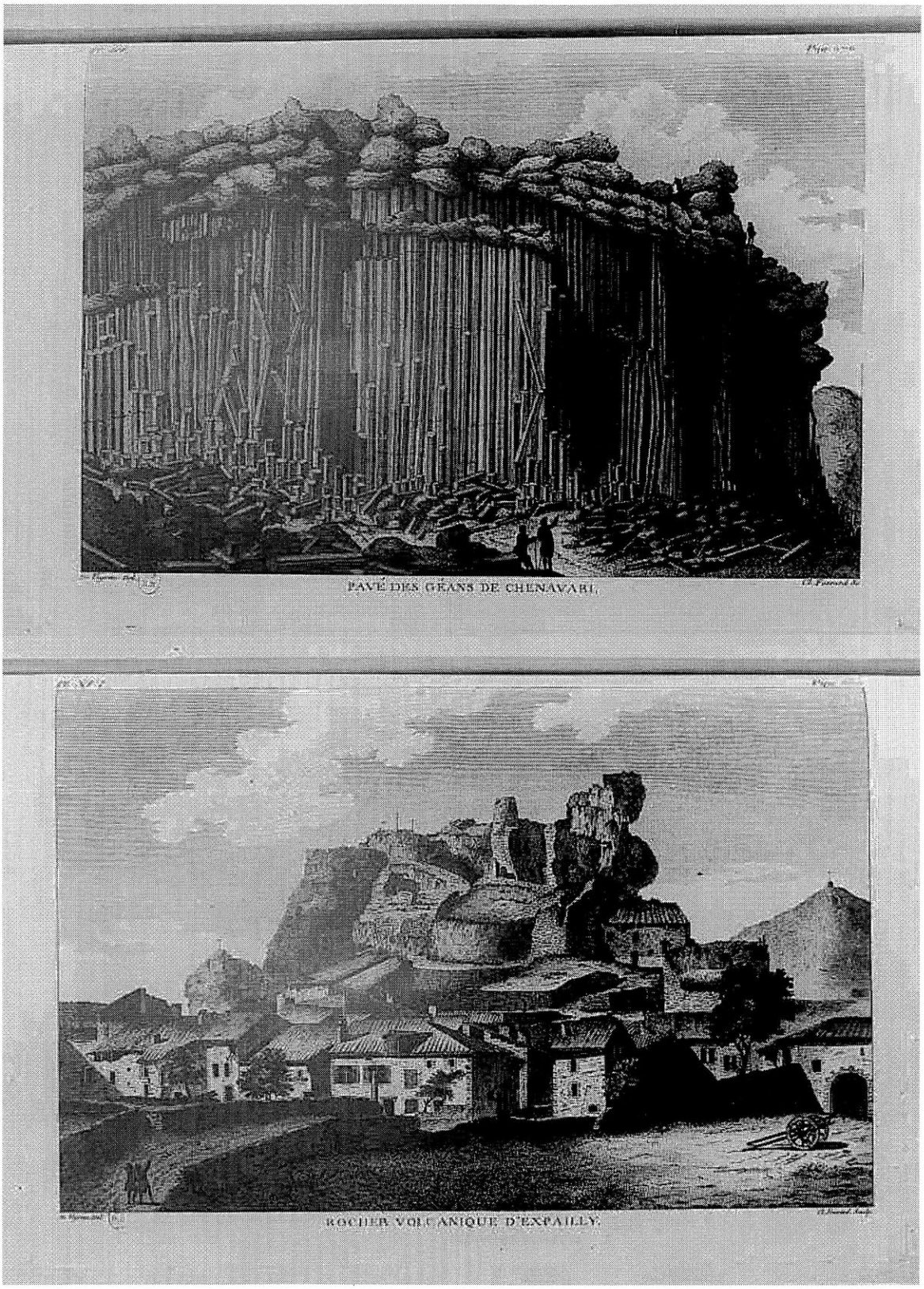


Fig. 0.5: Étienne-Louis Boullée, *Cenotaph dans le genre égyptian* (1781-1793), Bibliothèque nationale de France

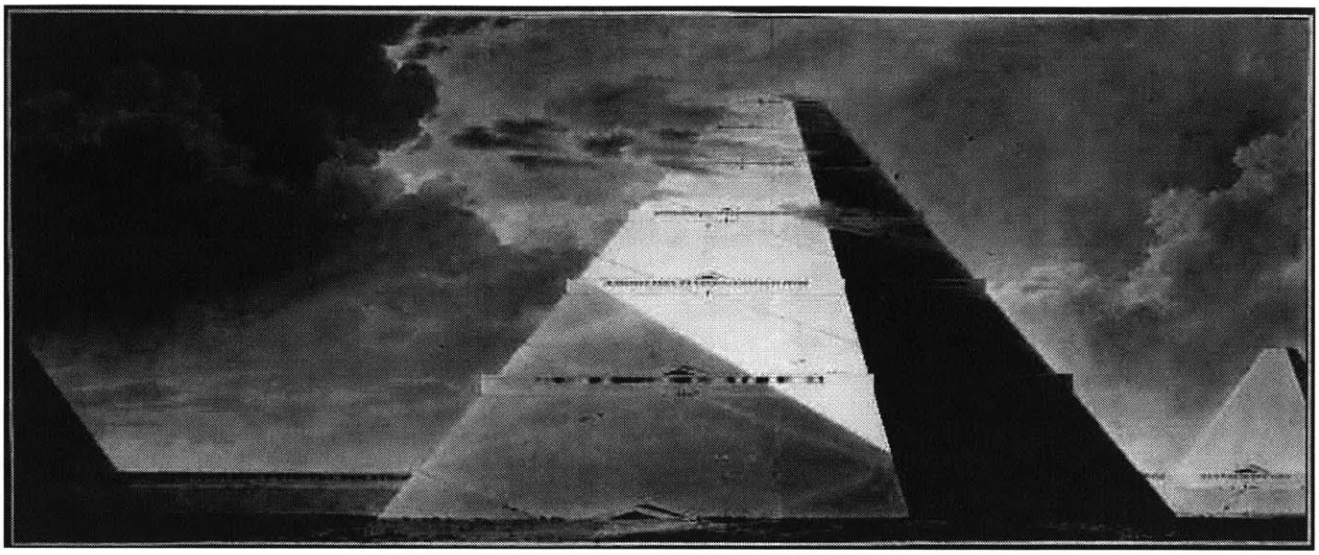
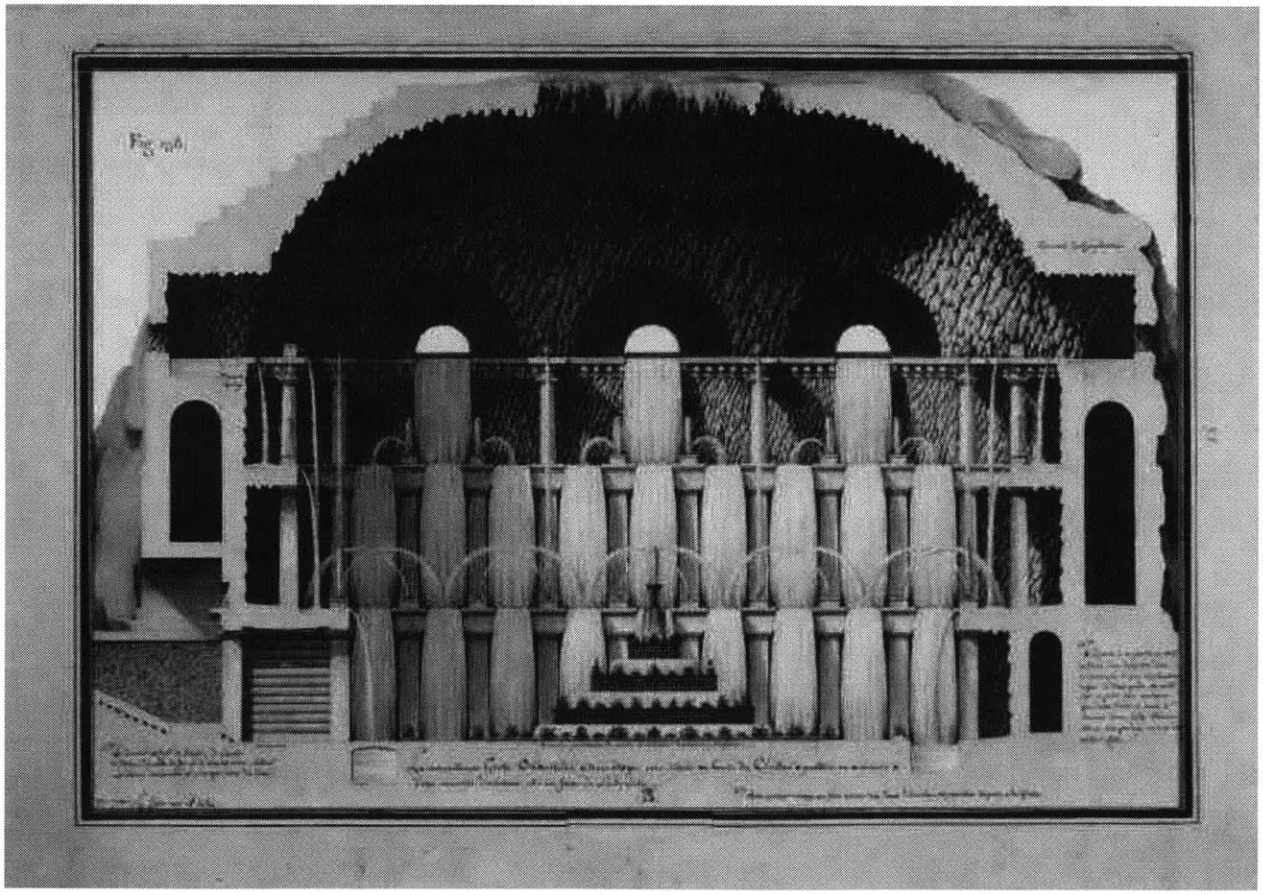


Fig. 0.6: Jean-Jacques Lequeu, *La merveilleuse grotte de océanitides à trois étage* (1777-1814) and *La maison gothique et porte de la pommeraie* (1777-1814), Bibliothèque nationale de France



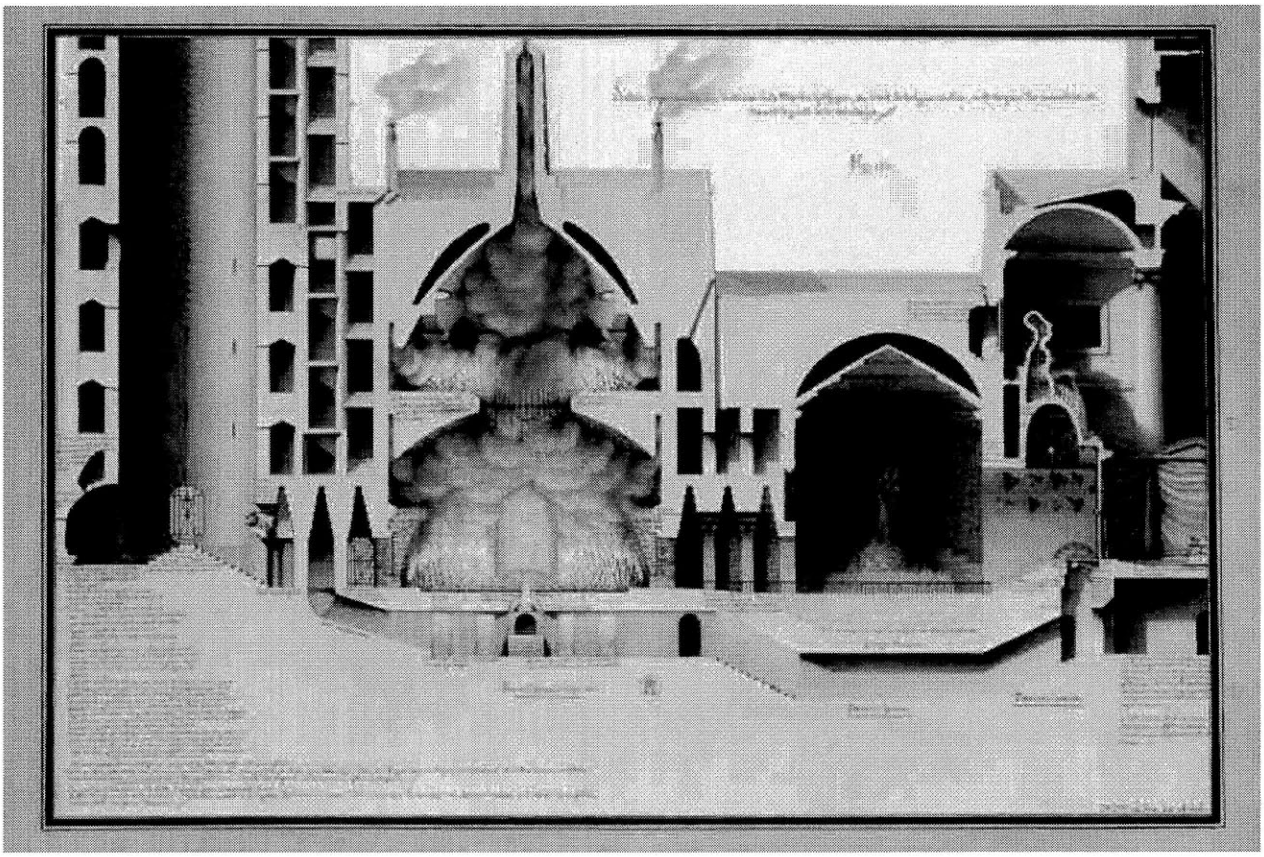


Fig. 0.7: Jean-Jacques Lequeu, *Coupe de la petite grotte du souterraine* (1777-1814), Bibliothèque nationale de France

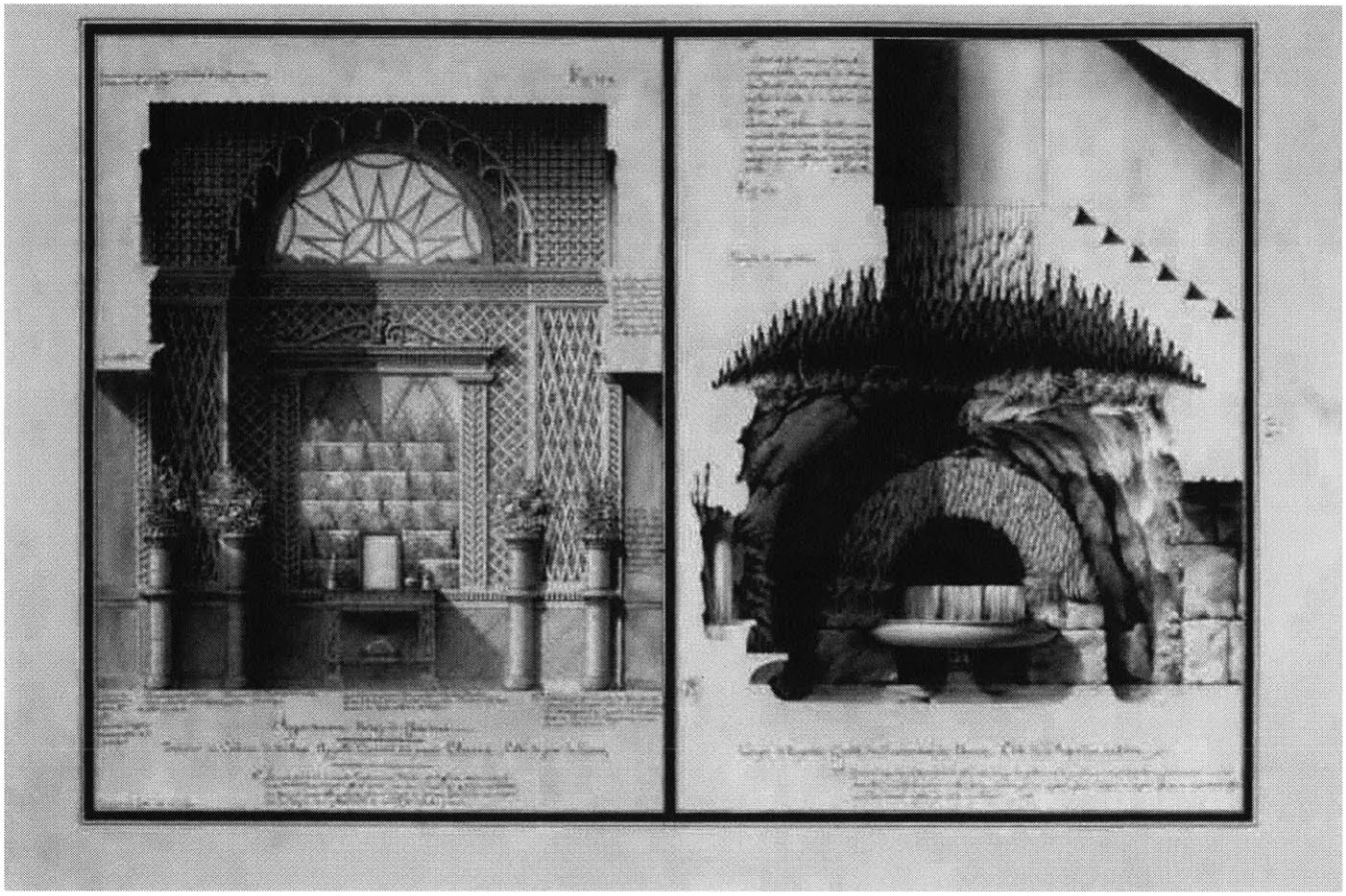
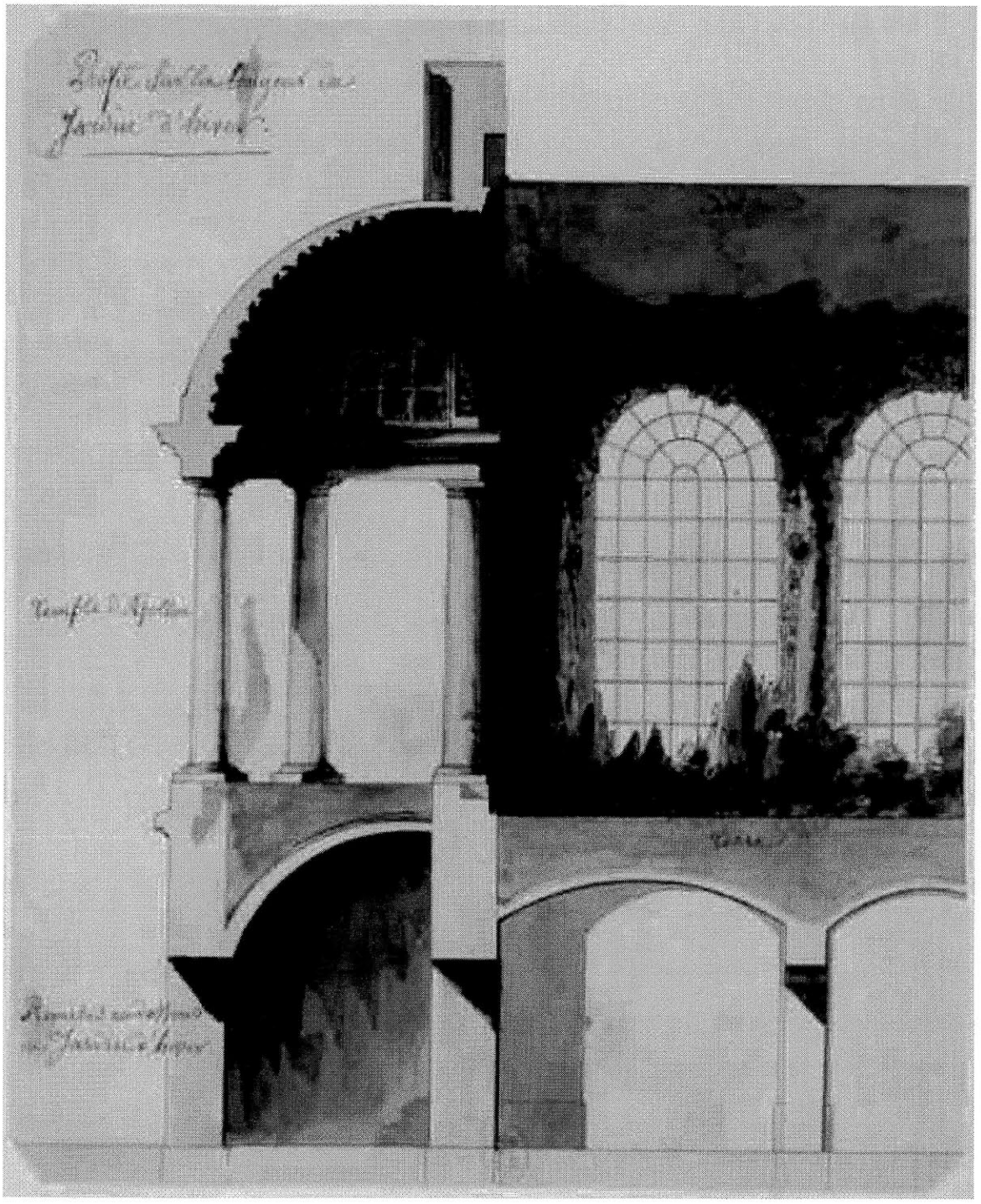


Fig. 0.8: Jean-Jacques Lequeu, *Profil sur la longeur du jardin d'hiver* (sic, n.d.), Bibliothèque nationale de France



[1] Jules-Adrien Blanchet, *Les souterrains-refuge de la France, contribution à l'histoire de l'habitation humaine* (Paris: A. et J. Picard, 1983). On the general science of geology, refer to Gabriel Gohau, *Les sciences de la terre aux XVIIe et XVIIIe siècles,*

*naissance de la géologie* (Paris: Albin Michel, 1990), troisième époque – les archives de la terre (l'ordre des montagnes, p.237-260); Simon J. Knell, *The Culture of English Geology, 1815-1851, A Science Revealed through its Collecting* (Aldershot: Ashgate, 2000); Gary D. Rosenberg, ed., *The Revolution in Geology from the Renaissance to the Enlightenment* (Boulder, CO: The Geological Society of America, 2009).

[2] Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (New York: Harper & Row, 1980): 36-38.

[3] Georgius Agricola, *De re metallica,* translated into English by Herbert Clark Hoover and Louis Hoover (New York: Dover Publications, 1950 [1556]): 1. See p.18-20 on geology during the time of Agricola and p.28-31on "Book I, Mining as an industry, its position in the realm" in Bern Dibner, *Agricola on Metals* (Norwalk, CT: Burndy Library, 1958). For earlier precedents on how men laid claims to precious metals, see Oliver Davies, *Roman Mines in Europe* (Oxford: Clarendon Press, 1935).

[4] Daniel Roche, translated from the French by Arthur Goldhammer, *France in the Enlightenment* (Cambridge: Harvard University Press, 1998). Roche states, "Here, too, there was a desire to compile vast documentary resources that combined observation of nature (climate, geology, physics of the earth) with agronomic, economic, and, increasingly, social statistics...This interest found an echo in the government's *dessein de savoir*, or science policy, which encouraged officials to subsidize countless surveys. In the last third of the eighteenth century, a new way of looking at the world emerged from these convergent desires. The curiosity of the cultivated elite expanded to embrace the entire world and inspired detailed exploration of France and Europe. For naturalists, economists, agronomists, travelers, and other observers, part of this new interest was undeniably utilitarian. In the quest to understand how the earth's natural features related to human geography, very few provinces went unexplored: Faujas de Saint-Fond roamed the Alps, Alléon Dulac explored the Beaujolais, and Legrand d'Aussy plunged into the heart of Auvergne" (24-25).

[5] T.A. Rickard, *Man and Metals: A History of Mining in Relation to the Development of Civilization*, Vol. II (New York: McGraw-Hill Book Co., 1932), chapter XI, "The Law of Mines and the Freedom of the Miner," p.571-639, 617-618. Silver was rare before the Roman period while iron mines were continuously exploited from this epoch into the Middle Ages. Southeastern France, comprising the middle and upper valley of the Isère, Provence, Maurienne, Oisans, and l'Argentière, were considered the most important districts unlike the Pyrenees. In the eighteenth century, mines sometimes interfered with the conveyance of water resources, upsetting the equilibrium in the environmental landscape. Refer to William Hooson, *The Miner's Dictionary: Explaining Not Only the Terms Used By Miners, But Also Containing Theory and Practice of that Most Useful Art of Mineing, More Especially of Lead Mines* (1742); Isabelle Laboulais, "Serving Science and the State: Mining science in France, 1794-1810," in *Minerva: A Review of Science, Learning and Policy*, Volume XLVI, n°1 (2008): p.17-36 and "Entre minéralogie et statistique territoriale : les enquêtes du Journal des mines entre l'an III et

l'an VI," in *Revue d'histoire moderne et contemporaine,* vol. 55, n° 4 (octobre-décembre 2008): p.57-81; Pierre-Claude Reynard, "Public Order and Privilege: Eighteenth-Century French Roots of Environmental Regulation" in *Technology and Culture*, Vol. 43, No. 1 (January 2002): 1-28, a case study of the hills west of Lyon from 1751-1763; W. Sharpe, *A Treatise upon Coal-Mines: Or, An Attempt to Explain Their General Marks of Indication, Acknowledg'd and Probable* (London: 1769).

[6] Emma Spary, *Utopia's Garden: French Natural History from Old Regime to Revolution* (Chicago: University of Chicago Press, 2000): 99-101.

[7] Antoine-Grimoald Monnet, *Essai historique sur l'administration des mines en France; Etat des mines ou recueil des observations, rapports et mémoires faits sur les mines*; *Exposition of mines, ou Description de la nature et de la qualité, à laquelle on la joint...une dissertation pratique sur le traitment des mines de cuivre, traduite de l'allemand M. Cancrinus par A. Monnet* (Paris: P.F. Didot, 1772). *Mémoire historique et politique sur les mines de France*, présentée à l'Assemblée nationale, Paris, 1790; *Traité de l'exploitation des mines...avec un Traité particulier sur la préparation et le lavage des mines* (Paris, 1773).

[8] Jeff Horn and Margaret C. Jacob, "Jean-Antoine Chaptal and the Cultural Roots of French Industrialization" in *Technology and Culture*, Vol. 39, No. 4 (October 1998): 671-698, 676. Materials such as clay were judged as significant as precious metals, which promoted French geology's propitious advancement and the image of France as a nation with competitive manufacturing edge. This coveted reputation resonated within these technical treatises that discussed the landscape's resources for use as designated commercial products. Refer to François Cruzet, "Angleterre et France au XVIIIe siècle: essai d'analyse compare de deux croissances économiques" in *Annales: Économies, societies, civilisations* 21: 254-291; Cruzet, *Capital Formation in the Industrial Revolution* (London: Methuen, 1972); Alessandro Stanziani, dir., *La qualité des produits en France, XVIIIe-XXe siècles* (Paris: Belin, 2003).

[9] Martin S. Rudwick, *Worlds Before Adam: The Reconstruction of Geohistory in the Age of Reform* (Chicago: University of Chicago Press, 2008): 39-45. On visual drawings created by geologists, see Rudwick, "Caricature as a Source for the History of Science: De la Beche's Anti-Lyellian Sketches of 1831" in *Isis* 66 (Winter 1975): 534-560.

[10] Stephen Jay Gould, *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time* (Cambridge: Harvard University Press, 1987): 15.

[11] Alix Cooper, *Inventing the Indigenous: Local Knowledge and Natural History in Early Modern Europe* (Cambridge: Cambridge University Press, 2007): 2-5. Naturalists were never in a position to make generalized claims and defined themselves through local knowledge versus universal knowledge. See chapter 3, "From Rocks to Riches: The Quest for Natural Wealth," p.87-109. "Regional mineralogies" drew upon

the concept of "natural wealth" and notions of productivity, on the necessity of human ingenuity, intervention, and labor to ensure proper deployment of natural riches. Local specimens proved their usefulness by representing the production of their own areas, fostering a culture of exchange and interpretation. I thank Lydia Barnett from Stanford University for this reference.

For contemporary articles on the concept of territory in architectural history, see Edward Eigen, "The Perils of Historical Geography: On a Pretended Lost Map to a Legendary Sunken Forest" and Antoine Picon, "What Has Happened to Territory?" both in *Architectural Design*, Special Issue: Territory, Architecture Beyond Environment, Vol. 80, Issue 3 (May/June 2010), p.82-87, 94-99.

[12] Jean-Etienne Guettard and Antoine-Grimoald Monnet, *Atlas et descriptions minéralogiques de la France, entrepris par ordre du Roi*...(Paris: Didot l'ainé, 1780), Bibliothèque Nationale de France, Paris. In a concurrent period, regional mineralogical surveys were also being completed in Great Britain, particularly of the area that housed Coalbrookdale factories and manufactures. For example, see Hugh S. Torrens, "Arthur Aikin's Mineralogical Survey of Shropshire 1796-1816 and the Contemporary Audience for Geological Publications" in *The British Journal for the History of Science*, Vol. 16, No. 2 (July 1983): 111-153. Fortresses situated within three-dimensional relief maps, representing waters, trees, rock formations, were created for Louis XIV beginning with Dunkerque, designed by the military engineer Marquis de Vauban.

[13] Rhoda Rappaport, *Studies on Eighteenth-Century Geology*, edited by Kenneth L. Taylor and Martin Rudwick (London: Ashgate Variorum, 2011): paper V, 272-287; paper VI, 233-244.

[14] Antoine Monnet, *Exposition des mines, ou Description de la nature et de la qualité des mines: à laquelle on a joint des notices sur plusieurs Mines d'Allemagne & de France; & une Dissertation pratique sur le traitement des Mines de cuivre, traduite de l'Allemand, de M. Cancrinus* (Paris: Chez P. Fr. Didot, Edme, 1772): 17?

[15] Sidney Pollard, "Coal Mining" in Charles Feinstein and Sidney Pollard, eds., *Studies in the Capital Formation in the United Kingdom, 1750-1920* (Cambridge: Cambridge University Press, 1988).

[16] Barthélemy Faujas de Saint-Fond, *Histoire naturelle de la montagne de Saint-Pierre de Maestricht* (Paris: Chez J. Jansen, An 7 de la république française): 38-45. Refer to Planche 1: Vue de l'entrée principale des galeries souterraines (Vue exterieure de la principale entrée des Galleries Souterrainea des Carrieres de la Montagne de St. Pierre près Mastricht) and Planche II: (Vue interieure de la principale entrée de la Caverne, sous le fort de la Montagne de St. Pierre près Mastricht).

[17] David Aubin, Charlotte Bigg, and Philipp Felsch, eds., *Science in Context*, Vol.22, Issue 3, (September 2009): "Introduction: The Laboratory of Nature – Science in the Mountains" on the cultural and social representations of mountains, 311-321. On the

damage perpetrated by human beings on the Alps mountains, see Isabelle Richefort, "Métaphores et représentations de la nature sous la Révolution" in *Nature, environnement et paysage: L'héritage du XVIIIe siècle*, eds. Andrée Carrol and Isabelle Richefort (Paris: 1995).

[18] Etienne-Louis Boullée, *Architecture, Essai sur l'art*, textes réunis et présentés par Jean-Marie Pérouse de Montclos (Paris: Hermann, 1968): 62-63. See Boullée's *Projet pour la bibliothèque royale de la rue Richelieu* (1785) and his underground museum from 1783 that also featured geometric volumes in their facades, elevations, and floor plans.

[19] Comparable images to the Egyptian cenotaph are Boullée's *Cénotaphe de Newton* (1784), *Chapelle morts* (1781-1793), *Entrée d'un cimetière* (1781-1793?) and Jacques-Louis David's *Study of a Pyramid.* Scholarly works written on Boullée and other utopian architects are Emil Kauffman, *Three Revolutionary Architects: Boullée, Ledoux, and Lequeu* (American Philosophical Society, 1952); Jean-Claude Lemagny, *Visionary Architects: Boullée, Ledoux, Lequeu* (Hennessey and Ingalls, 2002); Bruno Reudenbach, "Natur und Geschichte bei Ledoux und Boullée," in *Idea: Werke, Theorien, Dokumente, Jahrbuch der Hamburger Kunsthalle*, eds. Werner Hofmann and Martin Warnke (Hamburg: Prestel, 1989): 31-56; Anthony Vidler, *The Writing of the Walls: Architectural Theory in the Late Enlightenment* (Princeton: Princeton Architectural Press, 1996) and *Claude-Nicolas Ledoux: Architecture and Utopia in the Era of the French Revolution* (Boston: Birkhauser – Publishers for Architecture, 2006).

[20] Faujas de Saint Fond's etching of *Pont de Guele d'Enfer* (1778) depicts a similar type of waterfall. For other representations of underground fountains and caverns, refer to Jean-Jacques Lequeu, *Grande fontaine de l'Esplanade, adaptée au panchant de la Colline opposée a la Maison de plaisance*, Fig. 161 and Lequeu, *Section perpendiculaire de la caverne un peu travaillée du petit parc, des jardins delectable d'Isis*, 1791-1795.

[21] Jean-Jacques Lequeu, *Le cabinet de treillage et la grotte*, 1777-1814, Bibliothèque Nationale de France, Paris. For more in Lequeu, see Philippe Duboy, *Lequeu: An Architectural Enigma* (Cambridge: MIT Press, 1987).

[22] Bruce Redford, *Dilettanti: The Antic and the Antique in Eighteenth-Century England* (Los Angeles: J. Paul Getty Museum and Getty Research Institute, 2008): 93.

[23] Barbara Maria Stafford, *Voyage into Substance: Art, Science, Nature, and the Illustrated Travel Account* (Cambridge: MIT Press, 1984): 60. For geological formations as tourist destinations, see Richard Hamblyn, "Private Cabinets and Popular Geology: The British Audiences for Volcanoes in the Eighteenth Century," in *Transports: Travel, Pleasure, and Imaginative Geography, 1600-1830*, eds. Chloe Chard and Helen Langdon (New Haven, CT: 1996).

[24] James Hutton, *Theory of the Earth; or an investigation of the laws observable in the composition, dissolution, and restoration of land upon the Globe* (Edinburgh: Printed for Messrs Cadell, Junior, and Davies, London; and William Creech, Edinburgh, 1788). See the works of John McPhee, including *Basin and Range* (1982) and *Annals of the Former World* (2000), on contemporary notions of "deep time" and geological history in North America.

[25] Rudolf Wittkower, "Imitation, Eclecticism, and Genius" in *Aspects of the Eighteenth Century*, ed. Earl R. Wasserman (Baltimore: John Hopkins Press, 1965): 147, 143-161.

[26] In this chapter, I incorporate eighteenth-century jewelry pieces and decorative objects from the Musée Arts Décoratifs, Paris, and Victoria & Albert Museum, London. Senior curators Anne Forray-Carlier and Richard Edgcumbe were respectively instrumental in providing access to these collections.

[27] I use newly discovered archival documents from the Administration des monnaies et médailles that describe silver taken from regional churches in the Meuse and Vosges to be melted down for currency at the l'Hôtel des Monnaies in Paris (1791-1798). To discuss ornament's function, see *Perspective* 2010-1, Ornement/Ornemental, Juin 2010, La revue de l'INHA, Actualités de la recherché en histoire de l'art, with an introduction by Oleg Grabar and débats "L'ornemental esthétique de la difference," "Y-a-t-il une lecture symbolique de l'ornement?" and "Interroger l'ornement après Riegl." On British minting, see Philippe Minard, "Le bureau d'essai de Birmingham, ou la fabrique de la reputation au XVIIIe siècle" in *Annales: Histoire, Sciences Sociales*, 65e année, Septembre-Octobre 2010: 1117-1174, 1135; on marking silver, refer to Michèle Bimbenet-Privat et Gabriel de Fontaines, *La datation de l'orfèvrerie parisienne sous l'Ancien Régime: poinçons de jurande et poinçons de la Marque, 1507-1792* (Paris, Commission des travaux historiques de la Ville de Paris, 1995): 49-66.

[28] Susan Stewart, *On Longing: Narratives of the Miniature, the Gigantic, the Souvenir, the Collection* (Durham: Duke University, 1993): 135. Comparable to found objects, "through narrative the souvenir substitutes a context of perpetual consumption for its context of origin...like the collection, it always displays the romance of contraband, for its scandal is its removal from its 'natural' location. Yet it is only by means of its material relation to that location that it acquires its value."

[29] On the relation between geology and landscape, see Rebecca Bedell, *The Anatomy of Nature: Geology and American Landscape Painting, 1825-1875* (Princeton: Princeton University Press, 2002); Dennis R. Dean, *Romantic Landscapes, Geology and Its Cultural Influence in Britain, 1765-1835* (Ann Arbor: Scholars' Facsimiles & Reprints, 2007). See chapter 2, "Sublime, Picturesque, and Geological" p. 53-73 and chapter 3, "Caverns of the Mind," p.75-91; Noah Heringman, *Romantic Rocks, Aesthetic Geology* (Ithaca: Cornell University Press, 2004); Charlotte Klonk, *Science and the Perception of Nature: British Landscape Art in the Late Eighteenth and Early Nineteenth*

*Centuries* (New Haven: Yale University Press, 1996); Marcia Pointon, "Geology and Landscape Painting in Nineteenth Century England"; on depictions of walls of rocks and craggy cliff faces, Kim Sloan, *Alexander and John Robert Cozens: The Poetry of Landscape* (New Haven, CT: Yale University Press, 1986); Pamela J. Warner, "Nature's Ruins: Art in the Golden Age of Geology" (1996) unpublished M.A. thesis at the University of Delaware.

Andrew Graciano, "The Book of Nature Is Open to All Men': Geology, Mining, and History in Joseph Wright's Derbyshire Landscapes" in *Huntington Library Quarterly*, Vol. 68, No. 4 (2005): 583-599. Based upon his reading of John Whitehurst's *An Inquiry into the Original State and Formation of the Earth* (1778) and Wright's paintings, Graciano suggests open-ended conceptual links between the perspective of the painter (rendering surface detail) and that of geologist (penetrating gaze) when looking at the surface and substrate of the earth. There were never clear-cut distinctions between those two modes of seeing; for miners, topography was believed to be a reliable indicator of what lay beneath the topsoil (583). He distinguishes Wright's perception of landscape from that of other Continental artists.

[30] Dan Edelstein from Stanford University has labeled this audacity, "daring to know," in a special issue "Super Enlightenment: daring to know too much" published in *Studies on Voltaire in the Eighteenth Century*, No.1 (January 2010). Mythology and occult knowledge are contemplated as tangential areas of study investigated by European philosophes along with more traditional intellectual disciplines.

## CHAPTER 1

### On Diamonds: Lapidarian Mimesis and Experimental Techniques of Artful Imitation

Her husband frequently remonstrated her, saying: "My dear, as you cannot afford to buy real diamonds, you ought to appear adorned with your beauty and modesty alone, which are the rarest ornaments of your sex."

But she would smile sweetly and say: "What can I do? I am so fond of jewelry. It is my only weakness. We cannot change our nature."

- Guy de Maupassant, "The False Gems" (1880s)

In 1889, Germain Bapst, a descendant of a renowned family of French jewelers, published one of the first complete records of the French royal collections of gemstones. The illustrated multi-volume work was less a catalogue than an extensive commentary on the political history to which the collections bore witness. For example, Bapst included Sébastien Antoine's engraving of the crown designed by Claude Rondé for Louis XV's coronation **(Fig. 1.1 and 1.2)**. The image in question, which situates the finished artifact squarely on the page, includes no less than sixty-four colored stones along with approximately 282 diamonds. At the center of all of this is the famous Regent diamond, there to convey the sheer extravagance of the ritual object.[1]

The Regent weighed 546 carats and was worth, Bapst remarked, an estimated six million livres. Louis XV wore the distinctive stone as a decorative ornament in honor of a 1721 reception held for the Turkish ambassador Mehmed Efendi; it was subsequently placed into the center of his newly redesigned coronation crown. Stowed away in a Parisian attic, the diamond was retrieved again in 1793 and exploited as security against the mounting foreign debts accrued by the Directory. In the following years, the jeweler Marie-Etienne Nitot placed it upon the guard of the consular sword that Napoleon I

would carry at his anointment at Notre Dame Cathedral. The stone eventually escaped the 1887 sale of crown jewels and entered the collections of the Louvre Museum, spending World War II concealed behind a marble mantelpiece in the Château de Chambord.[2]

Diamonds cradled into metal settings could be displayed alone, as in the case of the Regent. Occasionally, they were reset into a larger ornamental piece to be displayed only for momentous occasions, such as a jeweled necklace for the order of Saint Janvier. **(Fig. 1.3)** The encrusted Saint Esprit cross, for instance, was perhaps only worn twice, once by Louis XIV and then possibly passed onto his son or grandson for a first baptism or summary communion. Composed of 400 diamonds, its spangled cross borrowed a recognizable insignia from the Knights of Malta: eight round-tipped branches with a fleur-de-lys inserted between each arm. Situated at the center of the cross was an outstretched dove with an open ruby beak, symbolizing the sacred and profane, which seized an oval 7.5 carat diamond, while four rings fixed to the arms of the cross allowed the piece to be sewn onto a knight's vestments when not hung by a grosgrain ribbon.[3] **(Fig. 1.4)** Louis XVI was depicted wearing the Saint Esprit cross pinned to a red waistcoat in a 1786 oil painting created by Antoine-François Callet (1741-1823).

Spectacular jewels such as the Regent diamond and Saint Esprit cross made their way into histories that became formulated as dramatic anecdotes. This chapter concentrates instead upon the prosaic, if not commonplace, diamonds that posed difficult challenges in terms of interpretation and production for the worlds of art, science, and politics.[4] Gemstones brought together makers and specialists across a wide array of epistemological domains; amateurs, artisans, early chemists, mineralogists, jewelers, not to mention bureaucrats and historians. Brought into close contact with nascent scientific

fields such as chemistry, metallurgy, and mineralogy, the artisanal trades of gem-cutting and jewelry making revealed a preoccupation with the physical properties and behavior of natural objects such as diamonds. Both external and internal traits — color, clarity, hardness, and a capacity for light refraction — determined how precious stones were deployed in individual jewelry settings and utilized as models for the fabrication of imitations that duplicated the surface textures or geometric angles of diamonds, emeralds, rubies, and sapphires. The cross-currents are complex and remarkable to unpack in their detail.

Such cross-currents between the real and the *contrefait* evoke what poststructuralist and aesthetic philosopher Louis Marin termed the *mimetic organon*, that is, a re-presentation of an artifact, image, or object, which enacts two contrary and simultaneous propositions. On the one hand, it emulates the model, and on the other hand, it acts through likenesses and unlikeness in relation to the very same model. In this scheme of things, what an artifact loses in "being" is regained by the resources of its art in emotive and sensory "effects."[5] Minuscule distinctions between an imitation and its model drew only greater attention to the imitation's artificial character. "...The dissimilar similarities that characterize it, its greater or lesser degree of resemblance," Marin stated, "put to work the 're' of representation, between duplication and substitution."[6] Strictly speaking, artificial diamonds were modeled after real diamonds; yet differences — slight deviations in faceting, smoothness, and coloration — from their exemplars caused imitations to appear even more unnatural by comparison. Artisanal effects, if executed well, diminished the more palpable disparities between a real diamond and its fake

counterpart. Because of their dual role as an artifact and copy, imitation diamonds generated both complementary and contradictory meanings at the same time.

Even some of the more subtle variances that distinguished the types of imitation gemstones listed in amateur treatises are quite revealing. Such texts referred to the merits of craftsmanship and economic value placed on the rarity of superior materials, but by the same token, they needed to valorize the notion of the artificial by distinguishing it from the notion of the imitation. The term *artificial* often entailed any type of substitution as part of the process of emulation whereas the *imitation* signaled the fact that false stones meant poor quality and craftsmanship.[7] This oscillating terminology pervaded manifold sources such as Pierre Le Roy's legislative documents on the privileges of silversmiths, Anselme de Boece de Boodt's *The perfect jeweler or a history of stonework* (1600-1700), and Macquer Le Blanc's *Experiments on the diamond* (n.d.). Extricating the "false from the fine," was, for Le Roy, of paramount concern when composing clustered precious stones for a metal setting. Written accounts of the false and fine often obscured the intricate distinctions that artisans in practice expressed about natural and imitation stones. The expression "false" connoted gemstones that were produced from artificial materials employed to assume the appearance of natural gemstones, while the word "fine" was associated with diamonds, emeralds, sapphires, and rubies whose economic worth was valued above other types of semi-precious gemstones. Real diamonds, in other words, were appreciated but so were their forged brethren — those artificial copies created from lead glass or crystal that often blended the natural and the synthetic.

The foundation of lived experience and experimentation shared by Enlightenment figures Denis Diderot, Louis Dutens, Pierre Elisabeth de Fontanieu, David Jeffries, Jean-

Baptiste Romé de l'Isle, and Guillaume-François Rouelle, surfaced in their awareness of and ambivalence towards precious stones, their visual attributes, and their complex scientific behavior (such as the evaporation of diamonds through intense heat). Diamonds, in particular, generated contradictory explanations related to form, function, and internal constitution. At the heart of debates surrounding diamonds lay tensions between functionality and authenticity. Diamonds, real or false, emerged as heuristic models of imitation in that they were perpetually being tested just as they were being invented. Thus they can be understood through multiple interpretative frameworks — that of trade and commerce, fabrication and experimentation — as well as through varying conceptions of artifice. The functional attributes of a diamond were those that could be imitated, controlled, or measured; such attributes were often privileged alongside original traits found in real diamonds. Conceptions of pragmatic usage and imitation were often interchanged and redefined by those who dictated which physical properties were pertinent for aesthetic standards and chemical mixtures in scientific assessments.[8]

There existed a diversity of inconsistent values among the assorted actors who attempted to qualify the physical attributes of a diamond. Certain attributes were, in essence, not regarded as authentic, that is, as not having originally occurred in nature. Merchants and lapidaries believed that the weight and structural constitution of a diamond were important considerations for financial compensation of their specialized services. Alternatively, amateurs, who fabricated their own imitation stones, privileged the coloration of an artificial gemstone. For early chemists, factors such as heat conductivity and hardness were particularly vital when evaluating diamonds subjugated to extreme temperatures. The transparency or number of facets on a diamond could be

deemed significant design guidelines for the production of an ornamental brooch, two characteristics that were equally important for calculating a precious stone's economic worth. These same traits were, however, deemed less crucial in the context of a mineralogical study determining a diamond's crystallographic structure. Faced with emulating authenticity, an artisan could manipulate given characteristics of a diamond based on aesthetic choice alone.

The first part of this chapter covers the history of artisanal corporations and guild traditions that concentrated upon the cutting, placement, and sale of diamonds and other precious stones. This is followed by a discussion that briefly addresses the contested position of gem-cutting as a fine art and then a section that analyzes jewelry settings and paste jewels, including decorative pieces that demonstrated the relationship between a cut stone, its setting, and its consequential visual arrangement. Correspondingly, mineralogical experiments, which delved into the causes of the structural composition and physical attributes of precious stones, and public demonstrations that featured the evaporation of diamonds questioned the veracity of empirical observations. Amidst intersecting areas of eighteenth-century trade, connoisseurship, craft, chemistry, and mineralogy, the physical properties of diamonds influenced a range of speculative hypotheses that determined aspects of function as well as appearance for artful imitation and scientific evaluation.

**Distinguishing false from fine**

Artisan communities were bound to venerable traditions of rigorous apprenticeship under skilled masters who operated guild workshops. Younger novices in

training were emancipated after earning sufficient experience under the tutelage of a guided hand, and the title of master was often handed down from one *compagnon* to his birth daughter or son. In its contemporary sense, the term *artisan* was certainly not applicable to the status of eighteenth-century tradesmen or salaried apprentices, but it could be used to describe the social reality and identifiable jurisdiction accorded to a skilled individual.[9]

Trade corporations closely monitored the activities of their members. The inspection of master goldsmiths – a practice that encompassed both jewelers and lapidaries – was stringently controlled by the internal administrative organization of each guild. Lapidaries, sometimes known as *orfèvres-pierriers* in given circumstances, were faced with periodical visits by the guards of goldsmiths. The shifting responsibilities of lapidaries that became areas of contention before the beginning of the eighteenth century were clearly illustrated in examples of medieval legislative incidents. In 1382, a German worker Jean Boulle cut diamonds in a private laboratory and refused to open his home to the inspection of the guards, relaying that the sizes of his diamonds did not lie within the purview of their prearranged jurisdiction. The guards, in response, informed the Prevôt of Paris of his obdurate resistance; henceforth, Boulle was ordered to make his dwelling accessible for the visual confirmation of his ongoing activities.[10] Growing numbers of tradesmen in the fourteenth century, who wished to exercise their talents, became provisionally known as some of the first lapidaries and were free to exercise their skills alongside goldsmiths. This trade freedom lasted until the reign of Henry II who, during the 1540s, then resubmitted goldsmiths to frequent reviews.

Flemish artisans played an important role in conveying gem-cutting techniques to French journeymen. One significant contributor was Louis van Berquem, a Flemish polisher who had enrolled at the Université de Paris around 1475. After his studies concluded, he transported his trade secrets back to Bruges, introducing the principle of absolute symmetry into the disposition of diamond facets.[11] Three of his most premiere cut diamonds were entrusted to Charles, the last Valois Duke of Bourgogne, who had purchased the original raw stones. During the sixteenth century Flemish goldsmiths, attracted to urban cities, often traveled great distances between Paris and London. They were typically not accepted by French guilds and instead plied their trade through clandestine arrangements, pledged as ill-paid subordinate workers to French master craftsmen. In 1584, Henry III revived the medieval tradition of lapidary guilds, whose influential members were all either Flemish or Portuguese Jews, who cut diamonds and other precious stones to be placed into metalwork.[12] Diamonds grew to be quite fashionable in France, set into buttons and used to embellish the surfaces of clothing. The art of diamond-cutting, according to historian François Crouzet, was a peculiarly Flemish skill, and therefore not one that the Parisians had successfully mastered since a sizeable labor force was needed to amass gradually over a prolonged period of time. Louis XIV revoked the Edict of Nantes in 1685 that had once protected the religious freedom of the Huguenots, forcing some 200,000 Protestants, including the king's own jeweler Sieur Pitau, to flee Paris. This mass movement caused many exiled lapidaries to settle in the lowlands of Europe — Amsterdam, Bruges, and Antwerp — where they were able to re-establish their ateliers.[13]

Medieval episodes reveal countless instances in which lapidaries were discouraged from cutting other precious stones to appear like diamonds. "For the precaution was so great as to prevent a less valuable species from being exposed to one richer to which it would have resembled in color," master goldsmith Pierre Le Roy in citing a 1387 guild edict,

> it was even forbidden to cut the stones that have some connection to the Diamond in any way ...All precautions that we have deduced in the two articles which contain it, were now more necessary for individuals who found themselves less than able to distinguish the false from the fine in jewels, nor the fine disguised as sophisticated, with the natural. But enlightened time has forgotten some of these precautions, such as avoiding the form of Diamond in the cutting of other stones, & apart from the Staining of Stones, & the Blending of the False with the Fine in the same Work, one can only say that other provisions remained in their full force, but that the public had suffered minimal damage from it.[14]

Judged worthless, false gemstones conjured fears of secrecy and concealment that had embattled early French administrators, who had tried to staunch imitation stones from flooding the country's economy. In other words, the term "false" connotated any object fabricated from artificial, albeit man-made, processes that attempted to simulate a natural gemstone. Some of these imitation techniques included the use of colored dyes and chemical ingredients mixed with crushed pieces of minerals. "Disguised" gems were believed to be synonymous with counterfeit goods, artificial nature, fraudulent pretensions, and more importantly, cheap quality. The physical form and settings associated with a typical diamond were considered singular since these characteristics did not belong to other precious stones such as emeralds and rubies. Along with the artificial staining of a stone's surface and the mixture of true gems with false stones, public buyers

were provided with sufficient warnings so that visual deception could be identified and avoided.

Goldsmiths were warned against inserting false gemstones alongside real precious stones in jewelry, ornamental patterns, and encrusted ornamental surfaces. Their compositional skills extended not only to the contiguous layout of the stones themselves, but also the methods that co-mingled their colors. Aspects of transparency within a design reflected the integrity of a precious stone as a type of natural material that should be represented as itself. Austere regulations as enumerated by Le Roy insisted that lapidaries could not "place false Stones or Pearls to be mixed confusedly with fine stones, or otherwise, at the same time, hold no false or falsified Stones in their Houses or Boutiques; on pain of confiscation... this mixing and falseness of Stones in our Jewelry, as the blending and the False touching metals in our silverwork."[15] Real gemstones were to remain separate from imitation stones; subject to confiscation by the police, goldsmiths were required not to expose the public to any perfidious mixtures of imitations and valuable stones and to forewarn them against confusing false stones for real gems, "a most precious species."

The disingenuous act of dyeing stones tried to impart visual attributes that made a "duplicate" seem much more expensive than its competing glass or paste counterparts. Tinted gemstones and their apparent defects would not be hidden beneath a thinly worn disguise or even a deluded veneer of color. In Le Roy's legislative documents, particularly article XV "neither dye nor disguise Stones" (1387), three visual clues were enumerated to shield the unsuspecting consumer against the imprudent purchase of fakes: first, the enhancement of luster by scarlet leaves below the setting of the stone, an act

made analogous to "tree leaves turning deep red in the autumn"; second, the coloration of one dye spread among others, such as amethyst within a ruby, and third, the manner in which the stone was sized and cut.

The heightened tensions between goldsmiths and lapidaries escalated noticeably, even as a sanctioned lapidary jury, which had been formed in 1584, supervised the guild activities of its members. On fairgrounds, the open commerce of diamonds as raw and cut stones exemplified an early example of laissez-faire economic trade. The lapidary committee, through a motion to council on May 4, 1613, challenged the goldsmith guilds' authority by obtaining a favorable ruling that banned foreign merchants from bringing, selling, or creating any cut precious stones within the royal domain.[16] A fine of one thousand livres was assessed if the law was broken. The committee insisted on previewing any and all goods that would be displayed or sold on site. This privilege, however, was repeatedly abused since lapidaries confiscated some of the better gemstones from visiting traders and divided them among themselves, under the semblance of this ordinance. As a result, many government guards insisted that the law be repealed, permitting open trade to recommence in December of 1614.[17]

As French citizens, lapidaries were not permitted to accept commissions from manufacturers or foreign merchants. They could only proceed with sanctioned projects within the city limits (otherwise they faced a potential fine of five hundred livres).[18] The tangible distinctions between raw stones and polished gemstones mirrored the fraught divisions between lapidaries and goldsmiths:

> But the Lapidaries made a Principle of undisputed law that the goldsmiths could put only the Stones into a work, arguing against this option of sizing them, & making loudly their Scriptures for public interest, which, according to them, could

> only suffer when a stone is cut & put into a work by the same hand, because, they said, some abuse would cover these two reunited operations; & would conclude that by dividing them, there would be nothing to fear from this moment onwards.[19]

By separating the operation of cutting precious stones from their placement into metalwork, lapidaries implied that greater public confidence in their craftsmanship would be restored. By extension, any autonomy granted to discrete tasks denoted a progressive step towards controlling a creative process in which artistic merit and economic rewards were intertwined. According to an ordinance from June 18, 1614, the techniques of the lapidaries would remain shared with their comrades in goldsmithing. Yet despite passage of this legislation, lapidaries nevertheless continued to sell gemstones consigned into ornamental items.

A more auspicious decision arrived in 1631 when the right to size and cut precious stones was awarded solely to the lapidaries, guaranteed under the provisions of the Parlement of Paris along with the right to sell jewels placed into decorative artworks.[20] However, lapidaries were not allowed to strip, dismantle, mount, or place stones into silver and gold jewelry; their legal responsibilities, in fact, were severely limited to the corporeal treatment and composition of precious stones (despite earlier advancements). In article XI from the same set of edicts documented by Le Roy, gem-cutters were relegated to these explicit chores and not expected to perform duties identified with goldsmiths or jewelers; if they violated these directives, a fine of three thousand livres, depending on the damages and interests of each individual case, could be assessed. Yet lapidaries generally assumed many goldsmiths were ineffectual at placing gemstones into metalwork:

> The Lapidaries forgetting that they had removed the ability of goldsmiths to cut precious stones, mainly due to the reason that the goldsmiths had solely to the exclusion of all others, that of mounting them, did not allow themselves to convene these two operations that they had found so incompatible in the goldsmiths: And the motive for the public good, which they had argued at the time of the l'Arrêt de 1631, disappeared soon to make way for their particular interest. The ability to put the stones into works of gold and silver, seemed to them no longer to belong solely to Goldsmiths, whom they did not believe were capable...[21]

Lapidaries confidently determined that the right to inlay stones into metalwork would eventually become theirs, reflecting a successive quarrel with the goldsmiths' guild on January 28, 1673. Their efforts, unfortunately, failed to gain any momentum, leaving the two techniques of cutting and mounting to remain distinct areas of technical expertise.

These erstwhile medieval attempts at regulating artistry standards resonated with the legislative policies adopted by successive sovereign regimes in the early to mid-eighteenth century. For example, article XXIII listed under "Of the sizing of Diamonds and all Precious Stones" (1768), insisted only lapidaries could size and cut raw stones. Brute stones, wheels (or *moulins*), or gem-cutting tools discovered anywhere other than in the custody of a lapidary master constituted a serious infraction. Besides diamonds and other precious stones, rock crystal and other glossy stones named *lustres* could be employed in artistic compositions by gem-cutters, to the exclusion of all other occupations. Within Parisian limits, lapidaries, gifted with the ability to mount rock crystal and other minerals, were also allowed to engage in the retail of these same stones with other jewelers and merchants.[22] Any special privileges relished by artisanal corporations, however, abruptly drew to a close with Minister Anne-Robert-Jacques Turgot's 1775 abolition of *jurandes*, who had long monopolized the manufacturing of

luxury goods. This decisive act lessened the country's rapidly ballooning deficit of 22 million livres. Most corporations were fully disbanded by 1790, diminishing the quality of French craftsmanship in the years to come. As we will see in the second chapter, this trend was not valid, and many artisans, including jewelers and silversmiths, continued to ply their trades as successful purveyors of the visual images that came with the French Revolution.

**Crafting brilliance**

Jean le Rond d'Alembert and Denis Diderot's *Encyclopédie ou dictionnaire raisonné des sciences, des arts et des métiers* (1751-1772), "aimed to bring knowledge of all disciplines within the grasp of the intellectually curious," as historian Colin Jones has put it. Their premeditated inclusion of "ignoble" trades was justified for three reasons; they believed that knowledge could be measured via mankind, or more specifically human value, and critiqued anything that did not conform to their notion of *utility*, a concept grounded in the social. Utility, they emphasized, enabled the action of social improvement.[23] According to the *Encyclopédie*, the lapidary vocation coincided with the early organization of an unnamed corporation of artisans in 1290, who, cut and sized diamonds for collectors as one of their initial professional responsibilities. Endorsed as the venerable "science of the ancient sculptors," the cutting of diamonds and other precious stones signified a trade category that operated under its own regulations and communal agreements.[24] *Diamantaires* were consequently placed under the sub-heading of *lapidaires* in the *Encyclopédie*, or those who specialized in the trade of diamonds — including foreign laborers from India who were adroit at selecting flaws in the raw

stones. Jacques Savary des Bruslons (1657-1716), in his 1723 *Dictionnaire universel de commerce*, which addressed the state of countries in four parts of the world, had remarked that Indian diamond cutters were rather adept at hiding the faults of their diamonds.[25] The diamond's functional usage for allied occupations such as goldsmithing, jewelry, and metalworking, its social reputation, and its scientific purposes were discussed prominently in several of the *Encyclopédie*'s entries written by a few unknown authors. Diderot designated an ideal diamond as an object whose "hardness and its specific weight give it a true distinctive character for naturalists...[it] possesses all these qualities to an eminent degree, across all centuries and in all policy nations."[26]

Many of the historical gemstones of the eighteenth century are represented in the collections of the Muséum national d'histoire naturelle in Paris and remain invaluable guides for modern-day mineralogists to determine the original dimensions of well-known specimens taken from countries outside of France. **(Fig. 1.5)** For instance, a displayed model of a 118-carat blue diamond (Bleu de Tavernier) named after one of the earliest European merchants Jean-Baptiste Tavernier (1605-1689) who had traveled to India, is accurately re-created in synthetic cubic zirconia, designating its angles, dimensions, and weight after placement into the insignia of the Golden Fleece. Tavernier's own plates of diamonds discovered in India include his sketch of the uncut blue diamond illustrating its thickness, upper and lower parts.[27] A later nineteenth-century drawing of the Koh-I-Noor and other historical diamonds similarly documents the number and configuration of each gemstone's facets. **(Fig. 1.6)** From the Mine du Cap, South Africa, a raw yellow diamond lodged in a rock lode exemplifies a more unrefined state of discovery.[28] One of the largest remaining jewels from the former royal collection is kept in the Mineralogy

department's storage room; a nameless large blue sapphire sits alone in a random wooden drawer, waiting to be analyzed.

While the *Encyclopédie's* descriptions acknowledged the existence of diamonds within royal or private collections, they were less attentive to the far-reaching trade networks that existed beyond the European continent. Scant notice was also paid to Indian diamond cutters and other colonial laborers who procured diamonds from sites outside of Europe. **(Fig. 1.7)** Most of the diamonds that were purchased and collected for royal cabinets and treasuries originated from outside Europe's borders, hailing from the Ganges river, Borneo island of Brazil, or the Coulour and Raolconda mines of Malabar. Beginning in the fourth century, diamonds were unearthed in colonial Brazil, which was owned by the declining Portuguese mercantilist empire.[29] Between 1770 and 1775, gold and diamonds from South America had brought great wealth to Europe. Annual estimates from 1730 and 1849 speculated that approximately 25,000 and 100,000 carats were sought for illicit and official purposes.[30] Historians of science Silvia Figueirôa and Clarete da Silva relate that "diamonds, discovered in Minas Gerais and the states of Bahia, Goiás, and Mato Grosso around 1720, were the mineral product of second importance, but by 1800, their production had dramatically declined than that of gold [sic] and the known diamond fields appeared to have been fully exploited."[31]

Overseas diamonds were sometimes procured under crude, if not oppressive, working conditions. Around 1792, French savant M. d'Andrada testified that naked slaves, dressed only in a simple deck, were unable to hide the precious stones in clothing; they washed the gravel from streambeds and chose the glistening diamonds lying among the pebbles. Diamonds, despite these deterrents imposed by slave owners, were still

stolen and peddled to smugglers in exchange for sundry items such as rum and tobacco.[32] However, the enforced labor of colonial populations, which raises ethical concerns from a modern-day perspective, remained integral to the procurement and commerce of diamonds that eventually arrived in Europe. Even though these significant repercussions are not discussed in this chapter, objects such as diamonds journeyed great distances from their initial points of origin, instigating far-flung effects in foreign countries that retained natural resources of economic worth.

Lapidaries were responsible for shaping diamonds but also possessed an astute eye for selecting quality gemstones based only upon their physical characteristics. Coinciding with the techniques of the jeweler (*joyaillier*) and goldsmith (*orfèvre*), the certified duties of a lapidary were rather limited, with only a few distinctions separating each type of occupation — from the acts of fabricating and selling metal wares to the concrete placement of precious stones into finalized works of art. Goldsmith-jewelers, sometimes conflated with jewelers, were granted the exclusive ability to sell and place diamonds, pearls, and other gems into decorative articles.[33] Categorized under the dual headings of art and commerce, *diamantaires* were also authorized to participate in the diamond trade and to size the stones for use in jewelry and decoration.

The descriptive terms *brillant*, *luster*, and *clarity*, as applied to diamonds in the *Encyclopédie*, enfolded a relative gamut of meanings. When connected to colors or metaphors, they implied a variety of aesthetic expressions, formal styles, and arcane symbolism for Diderot:

> The brightness goes beyond the brilliant, and this one here on sheen: there appears that the brightness belongs to brightly colored and grand objects; the brilliant

> diamond, of clearly colored petite objects; and luster, of recently colored and new objects. The flame casts a glow, the diamond shines, a new cloth has its luster.[34]

Raw diamonds (*diamans brut*), as an inclusive epithet, signified all objects in the initial state that nature had originally presented, a state intended to be rendered more sophisticated through the contrived means of art.[35] Authenticity, for d'Alembert and Diderot, was manifested through visible attributes of diamonds that indicated an untreated state where the stones retained their primal qualities and were unspoiled by man-made techniques.

Some of the more practical illustrations incorporated into the *Encyclopédie* are the elevations and perspectival views of various tools employed in the diamond cutting trade, which offer us a partial glimpse into the daily rituals of a lapidary's workshop. **(Fig. 1.8)** In Plate I, a geometric elevation and section of a wheel through one of its piles, screwed-in wooden slats, depicted on a rack, are fastened by a circular disk, while wooden rods tipped with sharp metals ends, known as *dops*, each secured a diamond employed for sharpening purposes. One can view the dop's spear-shaped tipped end. In an illustrated figure of *Plan de la meule*, the sanding disk used for burnishing diamond surfaces is shown. **(Fig. 1.9)** This same flat grinding wheel, turning at an accelerated rate, refined and milled down the sides of a diamond at different stages of the polishing process.[36] Even more modern versions of dops became gradually mechanized, allowing more rotations per minute to polish a diamond's facets more efficiently.

The extensive procedure of diamond polishing unfolded as a series of incremental stages that gradually transformed the brute stone from raw material into refined object. **(Fig. 1.10)** As seen in images of an English diamond cutter's bench (1749) as well as a

contemporary recreation of a lapidary workshop in Bruges, each stage of the process required precise knowledge of the gemstone's structure and skills to cultivate its external facets. D'Alembert and Diderot narrated the gradual alterations applied to a diamond:

> To engrave on stones and crystals, we used a diamond or emerald. The diamond, which is the most perfect and hardest of all precious stones, can only be cut by itself, and with its own matter. We begin by mashing two rough diamonds with the ends of two sticks large enough to hold firm in your hand, and rub them against each other, what we call dust, which serves to give them the shape and figure that one desires. Rubbing & containing dust of the two rough stones, the powder is received in a kind of box, which is called *gresoir* or *égrisoir*: and this is the same powder which is used later to polish and cut diamonds, completed on a mill that turns a soft iron wheel…The wheel on which the diamond is placed is greased with some olive oil. When one wants to cut facets, one changes the diamond from facet to facet as it is finished, and until it is in its last perfection.[37]

Due to their extreme hardness, diamonds themselves, in rough form and as a condensed fine powder, were employed to cut other diamonds as well as other precious stones such as emeralds. Along these lines, Jesuit priest François-Xavier d'Entrecolles recounted in 1712 that Chinese menders often employed diamonds as needles to pierce holes in broken porcelain pieces strung together by brass thread.[38] For an early brilliant cut that produced the best effects, a diamond was formed into at least thirty-three facets, inclined at four different angles, and wrought into twenty-five faces for the best angles of light refraction. Excavated diamonds fluctuated in their hues and pigments from a bold blood red and deep purple, to bright orange and light green (one of the most rare variations).[39]

Comparable to d'Alembert and Diderot, English jeweler David Jeffries, in *A treatise on diamonds and pearls in which their importance is considered* (1751), was concerned with multiple types of diamond cuts and manufacturing methods related to precious stones. In creating a brilliant square-shaped diamond, a six-pointed stone often found in nature should be used, he proposed, since it would provide the same depth and

proportioning on all sides. Created through artisanal shaping, the greater form of the diamond was ideally composed of two square pyramids adhered at their bases complete with eight triangular planar faces. The *girdle* of the stone, that is, where the pyramids were fused together, would be reduced into a square form; by adjusting the *table* (or large horizontal plane on the top of the brilliant) and *culet* (or small horizontal plane located at the bottom of the brilliant) the stone could be shaped in equal measures. The corners were then shortened. More detailed techniques comprised adding *star* and *skill facets*, small triangular faces that adorned the surfaces of the stone.[40] In privileging the quality gained by the type of cut and its resulting capacity for brilliance, Jeffries presumed that these traits were more important than the carat weight of a stone when deciding how to cut a crude diamond.

When buying a diamond, a consumer, for Jeffries, should always bear in mind its proportional increase, whose economic value was dependent upon the approximate square root of its weight, and whether it was a rough stone or a polished stone. The flagrant increase in the production of imitations being traded in England as "false stonework," a commodity that often passed for real diamonds, Jeffries lamented, was part of an "injurious practice." With the broad dissemination of his rules, he hoped to stem the egregious flooding of counterfeit stones into commercial trade thereby educating the public in order to preserve the well-earned prestige accorded to such costly precious stones as the diamond. For Jeffries, the greater quality of a diamond was closely linked to its inherent geometry and shape as authentic traits that would ensure more accurate facets.

The outward appearance of a diamond became a defining aspect of its identity. In moving towards pictorial catalogues and treatises, precious stones were often arranged by their color, form, or chemical properties, sometimes without favoring a particular organizational layout. **(Fig. 1.11 and 1.12)** In several plates from François-Louis Swebach Desfontaines' (1769-1823) unpublished work on natural history, diamonds were set apart as typological specimens. After Fabien Gautier d'Agoty who had begun printing thirty color plates for Romé de l'Isle's *Histoire Naturelle Règne Minéral* (1781) unexpectedly died, Desfontaines took over his position and hand-colored many of the illustrations for the pending volume. Diamonds were depicted as ten physical variations — from a tetrahedral geometric lozenge to a half-cut moon shape — representing a few of its naturally occurring forms. The stone appeared as a singular mineral or sometimes as a cluster of multiple crystals.

Sapphires and diamonds were not simply collected as whole gems but were often carved with intricate ornamentation and aristocratic portraits. Print collector and art historian Pierre-Jean Mariette (1694-1774) discussed instruments and tools associated with etching precious stones in his *Traité des pierres gravés* (1750) — an archetypal eighteenth-century amalgamation christened as a *Bibliothèque raisonnée*, inventory of collectors' cabinets, and *recueils de gravures*.[41] Mariette, as identified by cultural historian Ivan Gaskell and other scholars, was one of the first print dealers to place importance on the concept of provenance for artworks in order to discern patterns of attribution, style, and usage. Drawings and paintings, in this vein, became reflective of the mental processes of their makers, and henceforth, dealers such as Mariette assigned responsibility for an artwork, controlling its initial conception and reception into

commercial sales.[42] The diamond described by Mariette was treated the same as an aesthetic object; he called it a precious stone of the primary order, citing its familiar penchant for brilliance and strength of durability. He provided pedagogical suggestions to the amateur collector on how to identify meaningful specimens, many of which no longer existed. Mariette asserted that the psychological state of using reasonable judgment depended on prolonged exposure to the presence of beautiful things, not only for those unskilled in the art of connoisseurship but even for those who already possessed highly cultivated taste. Identifying a table that was Flemish or Italian in origin was far simpler than distinguishing between ancient and modern sculpture, which necessitated knowledge beyond the plain comparison of drapery, anatomy, or motion of the modeled figure. In bestowing an aesthetic verdict upon diamonds or furniture, Mariette urged collectors to exercise visual restraint —

> One may be born with good sense, we cannot boast of becoming a good Connoisseur, if they have not, so to speak, been familiarized with the works on which his good judgment is dependent. They need to consider them for a long time, to put in parallel beauty with the poor, and make a comparison with the beautiful which is more perfect to be able to determine with certainty & justice. This way of comparison abbreviated much work, one gains experience: do this after which the eyes directed by taste, one will know to distinguish the manners, and the original work, from that of the Copyist, & discern whether the object is good or poorly designed, and if the figures are in their proportions.[43]

Cultivated knowledge of art entailed a significant amount of time and commitment on the part of the viewer. Gemstones, like fine works of art, could be compared in terms of their clarity, color, proportions, and overall size; some specimens were far more aesthetically pleasing in appearance than others. It was paramount to avoid mistaking a precious stone for that of a glass imitation. Mariette commented that glass, being a porous material,

would be covered in miniscule specks, forming an unequal surface where the bottom of the engraving would be less uniform.[44]

**Fabricating the science of art**

Aesthetic judgment became an equally decisive factor in distinguishing the natural from the artificial, the beauteous from the misshapen, and the raw from the more refined. Processes of decay, death, and growth, defined by dynamic change and the material reformation of the natural world, were critical for any artisan to control and discipline. Medieval glassworkers had long employed a verbal and written rhetoric of describing the spectrum of glass colors according to the jewels that they most closely resembled in nature; in the spirit of the chant that once echoed in Abbé Suger's church, the Latin phrase "All thy walls are precious stones" also referred to the stained-glass windows that lined the interior of his cathedral.[45] French Huguenot refugees, for example, infused their own personal history into tactics to survive exile and spiritual loss, manifesting their clandestine artisanal skills as security in the transatlantic New World. Bernard Palissy, pronounced by historian Neil Kamil as a "metaphysical artisan," examined the craft of the glassmaker who liquefied stones and salt in a furnace. Such stones from Saintonge, France "exhaled" during the firing process, making it necessary for the journeyman to provide sel de tartar to serve as an active agent of congelation.[46] He was intrigued by the causes of embryonic geodes, which were well-horned, unsightly on the exterior, yet were white, sparkling on the inside, Palissy experimented with dissolving saltpeter (potassium nitrate commonly used in gunpowder and fireworks) in boiling

water, which left a noticeable residue of pleasing grids and crystals that materialized as "little diamond points."[47]

Anthropologist Alfred Gell's "enchantment of technology" profoundly communicates the power of art objects such as jewelry to captivate us with their technical effects. He related, "Art, as a separate kind of technical activity, only carries further, through a kind of involution, the enchantment which is immanent in all kinds of technical activity." The virtuosity of an artwork, beyond illusionism, is judged by the standards set by magic, which "haunts technical activity like a shadow."[48] The adept and prolific simulation of the colors of diamonds, emeralds, rubies, and sapphires was another artful skill unto itself, not only left to early chemists and experts in mineralogy but also attempted by factory owners, students, and self-taught inventors.[49]

Jean-Henri-Prosper Pouget in *Traité des pierres précieuses et de la maniere de les employer en parure* (1762) had confidently declared that eighteenth-century jewelry would eventually be designed for women, rather than for men, "in the age of the diamond." Men, in the past, were primary patrons of jewelry commissions that were imparted as gifts, but with the advent of the eighteenth century, aristocratic women, such as Madame de Pompadour, became significant clients themselves, choosing what types of gemstones to wear and which sartorial fashions to follow. Jewelers like Pouget often employed the *doublet*, or a composite form that lent itself to a combination of real stones and imitation gems where the upper and lower portions were cemented together to give the appearance of a singular stone. From a *genuine doublet* to a *semi-genuine doublet*, where one half is a true stone and the other half is made of semiprecious stone or glass, the variations of the lowest order included the *false doublet*, where both halves were

made of glass, sometime with only one half being colored. The *hollow doublet* was an aptly labeled vacant crystal filled with colored glass.[50] Man-made ornamentation such as jewelry became the rational interface between unrefined stones, artifice, and design ideals of form and function drawn from nature.[51]

The creation of false precious stones and their placement into necklaces or rings prompted a greater intellectual query: do aesthetic techniques of jewelry belong with the fine arts alongside established customs of painting or sculpture, or should they be allied with the more quotidian trades of goldsmithing and the production of fine metal currency, silverware, and other domestic objects such as furniture? Marcia Pointon's recent book *Brilliant Effects: A Cultural History of Gem Stones and Jewellery* (2010) sustains the accepted interpretation that the construction of identity, possession, and the legibility of power are embedded in precious stones. Their semantic connotations were communicated through their status as artifacts in high art and popular culture. She calls upon nineteenth-century novels by Maria Edgeworth where young ladies preferred flowers to expensive jewels, and literary devices where the gemstone, rather than the setting in which the stone was placed, represented the whole of a decorative piece.[52] In retrospect, ordinary women of the nineteenth century who craved the ornamentation of jewelry bore more resemblance to Guy de Maupassant's heroine, the wife of M. Lantin, who secretly purchased real gems, with the gaudy appearance of paste jewels, without her husband's consent. Eighteenth-century aristocrats such as Marie Antoinette carried a different aura of adornment, wearing singular gemstones of unique historical provenance, and in their own way, were more fixated upon creating fashionable impressions. What Pointon determines to be "materially precious" was often subject to the shifting debates in secular

and religious society, where jewelry acted as a social agent in human relations, economic value, and visual/verbal representations, as purveyors of personal fantasy and ornament. While her tome outlines a broad range of ideas upon which jewelry converged, it remains unclear if the communicability of these artifacts and examples of the decorative arts enforced or dismantled certain subject-object relations between the viewer, consumer, and owner. These cross-references partially obscured the specific type of work they enacted for artisans in the eighteenth century.[53]

Entire gemstones commanded more thorough historical inspection than jeweled surfaces on decorative objects such as miniatures and snuff boxes. On some occasions, even the art object is completely left out of documented records. For example, legal account books or written correspondence associated with commissioned portrait miniatures embroidered with brilliant diamonds do not mention any authorship or the economic value of the miniature itself. The effective combination of portrait subject and precious stones, however, acted as a "cipher of memory," and as Pointon insinuates, in fact, "it is jewels that define the character of the object."[54] **(Fig. 1.13)** Contemporary historians of jewelry view such miniatures as incidental evidence, preferring to analyze the surviving decorative cases or frames, which are often their cardinal interest. Pointon is correct that these artifacts often contributed to a reading of the organizing governance of urban elites. Yet, it is German sociologist Georg Simmel's rhetorical discourse associated with the gift, Pointon has implied, that made jewelry into a relational object connecting parties who were otherwise unknown to one another through an act of open display. This social exchange enforces a sense of gratitude, or freedom without any duty,

from the recipient, who is then placed into a permanent position with respect to the individual who bestowed the jewelry.[55]

In accentuating some of the more parochial concerns of the eighteenth century, Katie Scott has argued that French artisans, decorators, and tradesmen were located outside given social hierarchies of fine arts institutions and participated in a non-literate world of workmanship that did not provide them with adequate access to the prerequisite channels of intellectual opinions, skills, and circulated publications. Artisans were required to demonstrate their design techniques as secure proof of their professional and public credibility, as evidenced by 1766-1767 lawyers' briefs from the Paris Corporation of Masters Painters and Sculptors that pitted the merits of artists against artisans.[56] As a cultural activity of the past, these arts were "produced in artisanal, pre-industrial conditions, positioned by modern historiography at the antipodes of design," and held in contempt by present-day scholars, according to Scott. They labored under what she surmises to be an unrepentant "double indictment" by "their place of distinction and by the structures of hereditary privilege and habits of extravagance, which under the *ancien régime*, supposedly gave them life."[57] **(Fig. 1.14)** Several types of artisanal skill were required for objects such a copper-colored, three-sided seal with painted scenes of pastoral leisure and military quadrilles by François Delapierre. The unique, if not somewhat disjointed, design included diminutive details ranging from brightly tinted rose paste stones on the copper-colored base, an axis and pin for the free rotation of the three elliptical framed scenes, to an intimate engraving of neoclassical nude figures carved in reverse on flat side of the seal. This unusual decorative item was most likely

requisitioned by an aristocratic patron whose personal tastes and contact with talented artisans such as Delapierre, allowed for such an eccentric enterprise to be devised.[58]

Eighteenth-century historians and intellectuals were respectively invested in the peculiar quandary of simulating precious stones. Louis Dutens (1730-1812), a French writer, philogist, poet, and historiographer to King George III of Great Britain, offered far less technical observations on the fabrication of gems than those published by Jean-Louis Baptiste Romé de l'Isle, who was invested in the principles of mineralogy. As a scholar, Dutens was not a craftsman but an intellectual who examined artisanal production from the perspective of aesthetic collections and natural history. Born in Tours around 1730, Dutens was the son of Calvinists, who had sought refuge in London with an uncle, a jeweler by trade. He had studied mathematics as well as several foreign languages including Greek, Italian, and Spanish, eventually securing employment as an academic tutor. Dutens authored manuscripts on Phoenician gold medallions, a chess-playing automaton, the burning mirror of Archimedes, theological controversies in the Christian church, and the world discoveries attributed to the moderns.

Dutens had written his own treatise entitled *Some precious stones and some fine stones, with the ways to know and evaluate them* (1776). He provided commentary that addressed popular explanations of the diamond, ruby, sapphire, emerald, topaz, and garnet. Dutens believed that Pliny the Elder's disordered style of writing, despite his broad familiarity with natural history, did little to alleviate the precision of knowledge needed to comprehend the characteristics of precious stones. Among more theoretical writers, he singled out Jacques-Christophe Valmont de Bomarre (1731-1807), who had reconciled the viewpoints of the mineralogist and the jeweler into a single manuscript,

and perceived Romé de l'Isle's complete treatment of crystallization and minerals to be one of the best treatises on the subject, which adjured new methods and a proper nomenclature for modern authors and jewelers.[59] "This dissertation," Dutens equally remarked on his own work, "can serve as a plan to form a system, not only an idea that needs to be proven in practice" with terms of comparison for colors that were easy to produce and recognizable to many laymen. In the spirit of erudite savants who had traveled widely across the continent, he had visited many principal cabinets of natural history in European cities such as those of Prince of Luxembourg in Vienna where he had espied a black diamond and consulted with naturalists and expert jewelers; he intermittently relied upon the second-hand experiences of other acquaintances when he was not able to visit such objects in person.[60] He wrote that the Orloff diamond had been torn from the eyes of a Brahma statue in an Indian "Temple of Sheringham" by a deserter from a nearby French garrison. Some of Dutens' more inflated anecdotes were not completely accurate in their facts. But it should be recognized that he attempted to establish his capacious awareness of the cultural contexts in which precious stones were situated.[61]

Dutens presented a mathematical evaluation for appraising the economic worth of a diamond. **(Fig. 1.15)** A practical rule, he suggested, was to multiply the squared value of its weight by the amount of louis per carat in order to supply a numeric value. The calculated worth of a raw stone, in this way, could be accurately estimated for the purchases and sales of diamonds. For a raw diamond weighing two carats, its value, for example, would be eight louis. If a diamond was carved, one would double its weight after the shaping had been completed. The formula was slightly varied if the diamond

sustained inherent flaws; the weight was still squared, but the resulting number was multiplied instead by half of the value of a carved stone.

In referring to gemstone's properties, Dutens professed that yellow, green, or blue stones were far less durable than white ones since their weight and the metallic "juices" that imbued them with tonal color rendered them lighter, and consequently, less compact and durable in composition. "There are Sapphires, Amethysts, and above all the oriental Topazes, so hard, until they have lost their color by fire," Dutens detected, "some Jewelers have passed them as diamonds: but as these stones were never equal to a diamond in hardness, a Lapidary could not be misled by grinding it on the wheel."[62] On the one hand, durability was a natural and difficult trait to emulate successfully, and on the other hand, the superficial appearances of color were more easily achieved through chemical manipulation that enhanced the visual effects of a synthesized imitation.

Ruminate then, if you will, on a method offered by Pierre Elisabeth de Fontanieu (1730-1784) for formulating colored imitation gemstones – an alchemical process that many considered fallacious. His method was predicated on artificial mixtures that combined different metallic substances with rock crystal, nitrate salt, and sometimes arsenic, to impart the external appearance of a true jewel. Fontanieu, according to his entry in the Académie des Sciences, was an adjoint *chemist surnuméraire* until March 13, 1778, who then became promoted as a veteran associate chemist on January 29, 1779 and held the position of general controller for the royal Garde Meuble until his passing. He carefully recounted the various fondant mixtures that served as the chemical base for the imitation gems, materials used to tint glass, the manner in which to prepare each metallic chalk, and the painted colors employed as enamel. For a white diamond, the Mayence

fondant, as it was named, formed the foundational compound for an artificial clear gemstone; the fourth fondant was mixed with twenty-five grains of *lune cornée* or ten grains of antimony for a yellow diamond. Emeralds, however, required fifteen ounces of fondant, one copious helping of "blue mountain," and six grains of antimony. De Fontanieu's recipes for imitation precious stones included many ingredients from antimony, cobalt, magnesium, and other chemical powders.[63]

Unlike de Fontanieu who desired to emulate the visual characteristics of precious stones, pharmacist and chemist Louis-Nicolas Vauquelin (1763-1829), in contrast, wanted to isolate the active agent that gave emeralds their deep green color. Around 1797, he suspected what was now known as a chromium impurity was responsible for the gemstone's tonality and later discovered that the red tint of rubies was also generated by this very same element. French mineralogist René-Juste Haüy had urged him to analyze the physical forms and properties of emeralds more closely. Vauquelin, who contributed a volume on acids to a comprehensive dictionary of chemistry and helped edit the journal *Annales de Chimie*, proved that the beryl crystal and emerald possessed similar constitutions. Each one contained varying amounts of silica, alumina, another element later named glucina, with a trace of iron oxide.[64]

These specialized techniques, related to the fabrication of false precious stones, helped dictate the manner in which French authorities governed design procedures divided among jewelers, merchants, and silversmiths. Artistic currents such as the Rococo and the rising demands of consumer taste, in turn, partially instigated some of these same technical novelties. The tropes of the rococo have been dominated by what Marian Hobson has deemed *papillotage* — a visual scattering of the gaze that pulls the

spectator's eye over the patterned surface of decoration. Instead of conceiving these gestures as mere formal effects, some of the pragmatic demands of the rococo, in fact, became a critical point of departure for artistic innovations. Artisans engendered techniques that were necessary for a precise number of diamond facets, chemical mixtures of artificial gems, and types of settings for precious stones in brooches, earrings, rings, and necklaces. Rococo rings flaunted light-hearted themes featuring turtledoves sacred to the goddess Venus, jeweled hearts, twinned designs with dual stones, and ruby or diamond ribbons folded into lover's knots. Jeanne-Antoinette Poison, known as Madame de Pompadour, set the standards of fashion during the Louis XV period and owned a ring set with a diamond engraved with two crowned hearts, surrounded by green tinted brilliants. She often enjoyed wearing a cameo with a portrait of her lover Louis XV. In the 1770s, the style of a diamond set as a pointed oval or lozenge bevel came to be called a "marquise," named after de Pompadour herself.[65] To maintain the *douceur de vivre* that ornamental jewelry embodied, patrons typical had their jewels reset and redesigned since aesthetic styles transformed quite rapidly; these French designs were diffused by Huguenot artisans, who had settled in the Protestant countries, and by celebrated jewelers, who went from Paris by appointment to the courts of St. Petersburg, Madrid, and Copenhagen.

One of the lingering myths pervading the Rococo style was its reliance upon the use of asymmetry in bracelets and necklaces, interior ornamentation, and decorative silverware. Contrary to what might be expected, asymmetrical settings in rococo jewelry were considered extremely rare in production, as exemplified by some of the existing objects in the collections of the Musée des Arts Décoratifs in Paris. Much of the jewelry

from this period is more balanced in terms of visual design, situating motifs around one or more central or lateral axes. **(Fig. 1.16)** In a *bague panier*, flowers adorned with two green stones are set above a pink magenta semi-precious stone, encircled by small diamonds set off as clusters of budding shoots.[66] **(Fig. 1.17)** A diamond hairpin, positioned onto the upswept crown of a woman's head, swirls around two small metal rods, topped by a six-petaled flower amid flowing foliage and smaller flora.[67] Delights of fantasy and lightness, reflecting the affection for natural forms and the amusements of society, music, cards, sports, and masquerade, were present in *giardinetti*, small garden rings which imitated nature through vivid colored stones in gold highlighted by rose diamonds in silver collets. Pouget, in his jewelry designs, often placed flowers into a cornucopia, arranged them in baskets, and garnished them with loose flowing ribbons. Moss agates marked with swirled inclusions represented outlines of trees, heraldry, and abstract landscapes.

Real diamonds were subjected to limited physical shapes and sizes. **(Fig. 1.18)** One French ring circa 1775-1825, a golden band with a rectangular openwork bezel is set with brilliant cut diamonds surrounded by silver metal lined with gold. Upon closer inspection, we see that many of the diamonds employed as part of the ornamental banding – in the forms of teardrops, rounded oblong shapes, and small roundels – do not completely fill the spaces within the individual settings. Yet when perceived from afar, the diamonds appear to merge together as a continuous contour.[68] **(Fig. 1.19)** Faceted gems were often placed into organic-shaped settings, as viewed in a French brooch wrought as a dove embellished with diamonds, emeralds, rubies, and silver. Those stones set into the outlines of flowers, leaves, and wreaths left behind slight gaps in the

designated areas of placement.[69] **(Fig. 1.20)** In other objects such as a pair of bracelet clasps (1770), tiny brilliant diamonds were employed as detailed ornamentation, aligned around the circumference of gold metal set against central plaques of blue paste. One depicts a trophy of love, with fluttering doves, a quiver of arrows, and a hymenal torch while the other bears the ciphers of Marie Antoinette.[70] Like diamonds, pearls were subjected to different variations of jewelry settings. Designs for a pair of earrings laid out not only individual components but also slightly adjusted variations for the centered metalwork between individual pearls, from floral coronets to ribbons.

Paste jewelry benefited from certain advantages that real diamonds did not enjoy; it could be used to fill any type of round, cushion, or oblong shape that was not precise in circumference. Diamonds were rarely cut in non-uniform shapes since the economic cost would have been prohibitive for such designs. M.D. Lewis, an amateur jewelry aficionado, asserts that a high-degree of technical aptitude was obligatory for many of the designs of casts, fittings, backs, collets, graduation, shaped stones, and foiling required for eighteenth-century paste jewelry. By the year 1767, the corporation of *bijoutiers-faussetiers*, for example, had swelled to more than three hundred members as part of its ranks, demonstrating that the consumer demand had been a strong motivating force for the explicit production of such imitation gems. Favored by Spanish and Portuguese artisans, baroque schemes of unbroken strings of gems featured numerous stones of variable sizes with few gaps between the stone and its metal setting. **(Fig. 1.21)** Paste diamonds sometimes were cut into individual stones, as exemplified in a Pouget-inspired brooch taken from the collections of the Victoria & Albert Museum; they lacked, however, the reflective luster or refined finish belonging to a brilliant cut diamond when

compared with real stones under a magnifying loupe. Their edges were often rougher than those of a polished diamond, which possessed even and geometric sides. A tiny black spot at the base of a stone was a visual cue that a jewelry piece was composed from paste (a customary ritual for an artisan to apply pitch-like paint to the bottom facet).[71] Very few examples of paste jewelry have survived into the present day, and most of them that are stored in museum collections exemplify poor craftsmanship, making it difficult to surmise if the piece was fabricated from paste, glass, or another material altogether.

Commerical traders who sold paste jewelry and supplies were quite prevalent throughout Europe. G.F. Stras' trade card designed in 1735, for instance, illustrated the deity Venus accompanied by Tritons on the seashore holding plentiful jewels and corals. He created and sold fine diamonds as well as paste jewelry but dealt in exclusive accessories such as foils to place beneath cut precious stones and gold powders. M. Wickes and Netherton, distinguished jewelers in England during the 1750s, advertised their skills on trade cards handed out that read "Variety of Falsestone Work in Aigrettes, Earrings, Buckles."[72] The gradual perfection of Viennese goldsmith Joseph Strasser's 1758 paste formula used in costume jewelry and de Fontanieu's chemical fondants produced colorless glass paste that could be cut and molded into any shape, attempting to simulate the fiery depth of precious stones. This concoction could seamlessly match any curvilinear edges or forms mandated by an irregular setting, providing a clean fit between the gem and encasement that a faceted gemstone could not accommodate.

**Mineralogical experimentation**

In recalling Marin's mimetic organon, diamonds discovered in nature, unlike their imitations, posed a far more problematic obstacle for many early scientists interested in mineralogy and metallurgy. Those who pursued mineralogy during the eighteenth century devised their own empirical techniques to examine the physical characteristics of precious stones, establishing distinct conclusions about their variable structure and internal composition. Historian of science Hélène Metzger divided these disparate savants into two particular groups: chemists who employed the procedures of analysis and synthesis and physicists who indited long laboratory tracts that detailed the explicit processes behind experiments. Both groups, for Metzger, were among many proliferate authors of scholarly treatises that addressed the expanding theoretical expectations of mineralogy.[73]

As an early scientist interested in practical applications and theoretical outcomes, Jean-Louis Baptiste Romé de l'Isle (1736-1790) explored the internal symmetry of crystals and minerals as well as the external variations associated with the dominant physical characteristics of each specimen.[74] Vestiges of chemical elements, which could be crystallized into miniscule octahedral shapes, could predict a form's morphological genesis and existed in substances such as aluminum, diamond, and iron. In *Essai de cristallographie, ou description des figures géométriques* (1772), he outlined the divergent trajectories of mineralogical research and the characteristics associated with crystal-gems (*cristaux-gemmes*), which were embedded with angular forms presumed to be closely related to the shape of their rock crystal, and crystal quartz (*cristaux polygones*). "All angled bodies, such as rock crystal, diamond, spathe, marcasite, and

generally all mines," he affirmed, "are formed by the juxtaposition of molecules brought by an external fluid and not by inversion (or the insertion of fluid)."[75] Precious stones were conceived as having a pre-determined angular form, and subsequently, the internal processes of chemical flows and structural integrity of a specimen were reflected on the external geometry of its corresponding crystal.

The pronounced contrast between crystal gems and crystal quartz was grounded in the disposition of their interior parts.[76] Composed of tiny layers, applied one over the other, the bonded intersection between the two blades in crystal gems often produced light refraction. In contrast, crystal quartzes, having an equivalent layered composition to gems, possessed an internal makeup that was far more loose and crusty in texture, resulting in a glass or ice-like transparency; their internal fabric often appeared through fractures and was continued as a congealed fluid. The internal configuration of a diamond, Romé de l'Isle postulated, was visibly discernible at most times, and being similar to rock crystal, it emerged from a fluid contained in the cavity of rocks and was produced by the juxtaposition of material particles with the effect of penetrating fluid and ambient fluid.[77] Characteristics such as color also played a critical role in isolating the cause or source of variations between different types of crystals. Color was sometimes attributed to phlogistics, a process by which the ochre of a metal enters into the composition of a crystal; partial coloring was sometimes so abundant that a crystal could lose its transparency.[78]

Rome de l'Isle's terminology of angularity and geometry, comprising words that evoked *a priori* forms for crystals, crossed over into other epistemological domains, echoing familiar descriptors employed by collectors, engravers, and jewelers. This

ekphrastic lineage only served to further enhance the prevalent conception of minerals as natural objects with pre-determined origins. Rhetoric, whether utilized by Rome de l'Isle, Jeffries, or Diderot, bound together these parallel explanations of diamonds and precious stones; terms such as *fracture*, *layers*, *polygonal*, and *structure* endowed crystals with formal appearances but also more importantly, inscribed them with a corporeal constitution observed by these historical actors.

Metallic vapors that circulated within underground mines caused the dissolution of certain mineral substances, Romé de l'Isle confessed, when perusing the works of other naturalists. The red of a ruby and the purple of an amethyst periodically cultivated an intense blood red tone, like that of garnet, when fire and tin were applied together in tandem; the yellow of a Brazilian topaz, when heated, transformed into a red-tinted shade as well. "All these colors are more or less fixed by fire," he elucidated,

> ...some suffer little, others revived, others were much changed, others disappeared completely. These same stones that once seemed immune or indestructible by fire, are not all to the same degree, the most unalterable are the Ruby, Sapphire, Topaz, Chrysolite, and Hyacinth called Orient...The Diamond which passed for the most refractory of Crystals-Gems (in hoc igne refractorium, said Mr. Linné in 1768) loses the fire of its transparency, which is attributed to the dissipation of the acid that had entered its composition (I); it is foliated then it completely disappears.[79]

For Romé de l'Isle, identifying and differentiating natural color hues from those that were artificial in composition was dependent upon the prescient aptitude of a connoisseur's eye. In fact, mineralogy experts relied upon chromatic observations that provided information about a crystal's internal structure. He noted that a diamond's loss of transparency through the action of fire was triggered by acid that entered its material constitution, a key feature that would figure prominently in many of the experiments

committed to discovering the source of combustion in diamonds.[80] English scientist M. Elliot in the *Philosophical Transactions of the Royal Society of London* (1745), for instance, added that the specific gravity of diamonds, of which the climate, size, and transparency often differed, also played an important role in its potential decomposition.

In matching the skills of the connoisseur with that of the early scientist, Romé de l'Isle emphasized how a precious stone's visual characteristics were intimately tied to its core composition. He interpreted the art of shaping a diamond by beginning with its interior qualities, rather than its external characteristics. "The art of cutting or splitting the Diamond in a certain sense, is sufficient to demonstrate that this Stone is composed of small extremely thin layers," he remarked, was "so closely joined one to another, that the Stone would not allow it to be smooth and brilliant in the place of fracture." In advising lapidaries, he observed that an appropriate edge of a diamond for polishing was dependent upon the slender internal leaves within its structure -

> It is this disposition of the Diamond blades which oblige Lapidaries to search for the edge of the Stone for it to be given polish; without this precaution, they would not succeed, & the Diamond would warm up without taking any polish, as it happens in those called Diamonds of Nature, which did not have a directed uniformly edge. The diamond cutters compare these to the knots of wood whose fibers are curled up in a way that they intersect in different directions.[81]

The interior composition of a diamond, as understood by Romé de l'Isle, affected its outer geometry, and by extension, the stone's positioning into works of decorative ornament affecting the visual stability of a design. **(Fig. 1.22)** Artisans, predicted by other mineralogy experts such as René-Just Haüy who had founded the Musée de mineralogy in 1802, often rejected what were commonly called "diamonds of nature," refusing to polish them since they assumed that their interior ligature fibers were often contorted.

Contorted fibers did not lend themselves easily to techniques of cutting that required a clean angle of entry.

Exterior characteristics of a diamond reciprocally persisted as esteemed traits to ascertain a diamond's internal structure. The primitive properties of a mineral, specific to physics, were often referred to as the "outward form" of the specimen, such as characteristics of weight, measure of hardness, transparency or opacity, flavor, odor, and color. Taste as one of the sensory attributes of a mineral was highly prevalent in saline substances that were dissoluble in water while odor was at hand in flammable matter and metallic materials, which were often opaque.[82] Size, mobility, impenetrability, absolute gravity, or having "duration in the body," which made them inalterable by the presence of other foreign substances in its composition, endowed a precious stone with certain chemical behaviors.[83] Critical for enhancements in jewelry and metalworking, the diamond's property of hardness, nevertheless, lingered as an enduring principle for its changing usage in the practices of chemistry and mineralogy.[84]

**Combustion, visibility, and disappearance**

Factual acceptance of a diamond's hardness, though prevalent in academic circles, was still susceptible to open contestation by a number of early scientists, who had dared to test the extreme conditions under which natural substances could be subjected. Chemists Jean d'Arcet and Guillaume-François Rouelle (Antoine-Laurent de Lavoisier's teacher and owner of a pharmaceutical shop on the rue Jacob) were involved in the longstanding tradition of "evaporating" diamonds, a time-honored practice dating back to Isaac Newton.[85] Newton was, in essence, the first early scientist to conjecture that the

diamond was a type of combustible substance or "solidified oil."[86] Robert Boyle later became the first to study the action of fire on diamonds. Completed under the command of Emperor Francis I, d'Arcet and Rouelle's experiments, with the assistance of a burning mirror, reignited the controversy of the disappearing diamond as well as general interest in the chemical reactions of precious stones. A ruby had been positioned for forty-five minutes on the hearth of a burning glass until the precious stone had softened to the point of receiving a Jasper seal but had lost neither its weight nor initial shape. Having altered only its color, a companion emerald survived intact. Only the diamond of all of the gemstones, which had been burned, was destroyed; the fire was ostensibly the only clue to how the composition of the diamond was transformed. Both men demonstrated that a diamond was combustible when it was heated to a temperature inferior to that of gold, and it often did not withstand the process even when surrounded by a protective layer of lime or porcelain paste.

In their article "New experiences on the destruction of diamond in closed vessels" (1773), d'Arcet and Rouelle were determined to prove several objectives. They were interested in conveying how these trials had been executed. In addition, they inquired why salts dispersed the diamond into smaller pieces, and consequentially, what type of material would be a suitable choice for a vessel. Lastly, they wished to determine how a diamond could be conserved in carbon powder according to the procedure employed by the jeweler Stanilas Marie Maillard. Jewelers such as Maillard often had a difficult time giving sufficient credence to d'Arcet and Rouelle's results since they were often accustomed by practice to removing or diminishing the flaws of diamonds by exposing them steadily to sources of strong heat as part of treating the stones. Macquer Le Blanc,

another well-known jeweler of the eighteenth century who had provided d'Arcet and Rouelle with another diamond for testing, recalled that one of his diamonds had been encircled by chalk paste and charcoal, then placed in a crucible enclosed by sand.[87] After three hours of heating, this stone had completely vanished. The bewildering outcome suggested that the diamond's destruction was due to volatilization rather than combustion or fragmentation into small pieces unobservable to the human eye.[88]

The noticeable evaporation of a diamond was envisioned by many skeptics to be an improbable act of nature. At this point in the eighteenth century, many university courses, which had solely been taught through lectures, held open demonstrations that exhibited various physical principles such as centrifugal force, air compression, electricity, and magnetism. These popular experiments did, however, little to diminish the development of European science, which was mainly influenced by established organization such as the Royal Society in London, the Académie des sciences in Paris, and the Akademie der Wissenschaften in Berlin. Louis Dutens, on March 27, 1776, carefully witnessed M. A. Roux, a professor of chemistry at the Écoles de Médecine, who thrust three differently sized diamonds, each placed into a distinct porcelain cup, directly into a blazing fire that rose into a resplendent aura within the confines of an oven.[89] After being slowly heated for approximately two hours in the fire, they were immediately retrieved and re-measured for their size and weight loss; an analogous demonstration had been previously given on April 23, 1772, held in the presence of a gathered audience and a lieutenant police officer. The largest diamond donated by Count Alexandre Sergeevich Stroganoff had lost approximately two grains and one and three-twentieths of its original weight, while the medium-sized diamond had not decreased in mass but seemed to be

severely diminished in appearance.[90] The smallest diamond, however, had completely vanished. Two remaining diamonds were immediately returned to the oven, and within an additional hour and ten minutes, the medium-sized diamond had completely vanished while the Stroganoff diamond had also dissipated within another one hour and twenty-two minutes. Even the most solid, compact containers had remained vulnerable to the general physical principles that had transformed the stones within the heated oven and would not be able to guarantee their process of decomposition; Dutens insinuated that this palpable, recondite evaporation possessed a highly irregular manner.

In postulating this exoteric query at the end of his exposition on diamonds, he remained fascinated with the intrinsic disposition of this unique substance that seemed to dissolve. It was, nonetheless, clearly apparent to any vigilant third-party observer that the contents of the fire had consumed the diamond while other precious stones such as an emerald, which had undergone a similar procedure, had simply melted and changed color.[91] Dutens' observations evinced the preceding experimental trials of d'Arcet and Rouelle, who had alleged that the evaporation of diamond had occurred without the intervention of air. These same types of experiments, noted by Dutens, were repeated with a sapphire and a ruby that were both exposed to the same degree of heat as the aforementioned diamonds, prevailing as unchanged in their physical state. The degree of the fire had performed a lesser role in comparison with the destruction of the tested diamonds. For instance, an artisanal marker that had been placed onto the point of the ruby did not diminish on its surface, unlike that of the sapphire; its rouge color seemed to suffer from no apparent alterations.[92]

Lavoisier (1793-1794) came the closest to uncovering the elusive solution to the visible combustion of diamonds. Openly acknowledged for his pioneering contributions to early modern chemistry, he had cultivated exceptional interests in the burgeoning fields of geology and mineralogy, having accompanied Jean-Étienne Guettard in 1767 on an extended trip through the Vosges mountains to collect information for a commissioned mineralogical map of France. His eventual disputes with the other lead partner Antoine-Grimoald Monnet, however, forced him to withdraw from the project, but he did, regardless, manage to author three separate memoirs on mining and mineralogy as well as sedimentary strata.[93] After reading d'Arcet and Rouelle's methodical assessments of combustion, Lavoisier, in 1787, as a member of the new provincial assembly of the generality of Orléans and the Committee on Public Welfare and Agriculture, continued Rouelle's line of experimentation by placing a diamond into a sealed glass jar with air, concentrating the sun's rays through a thick convex lens onto the jar.[94] The diamond eventually burned away, leaving Lavoisier to assume that it was closely related in composition to charcoal, which tended to produce a residual by-product gas known now as carbon dioxide.[95] He became gradually preoccupied by other scientific matters, abandoning his research into a diamond's chemical composition. The perplexing act of evaporation, however, was eventually unlocked by his disciple Louis Bernard Guyton de Morveau (1737-1816), who, several years later, suggested that the combustion of a diamond occurred in the presence of the element of oxygen, meaning that the stone itself was probably comprised solely of pure carbon.

The gradual discovery of carbon dioxide was predicated upon a cumulative series of trials that attempted to verify a diamond's internal composition, whose most reliable

traits of hardness and clarity were found to be less than consistent when tested in various circumstances. If diamonds could be impelled to vanish into thin air, it was plausible for any physical characteristic assumed to be authentic to come under the suspicions of doubt, or at least, careful reconsideration of what were supposed conventions of truth. Diamonds demonstrated a variable potential for diverse techniques in artisanal fabrication, decorative jewelry, connoisseurship, and industrial trade. They attested to the fact that precious stones were not merely objects with static, permanent dispositions but instead possessed dynamic qualities that were demystified only through human intervention.

At the heart of these intellectual debates surrounding diamonds lay tensions between aspects of authenticity and functionality. Imitation gemstones, by resembling the visible characteristics of a diamond, became acceptable substitutes for authentic luxury items. This, moreover, did not invalidate attempts to thwart fashionable taste, class affluence, or economic stability, but on the contrary, it allowed the false to co-exist with the fine as part of a carefully composed object. Among local and national levels of manufacturing, the mass production of counterfeits affected public attitudes of consumption, which perpetually returned to questions of originality and deceptive artifice. Paste jewels and fondants as mimetic representations failed to address the formal limitations set down by aesthetic techniques in jewelry settings; they, in fact, ignored any design principles based in practice, preferring to evade demanding realities attached to real precious stones. In this case, diamonds discovered in nature raised a host of issues to which their imitations could not adapt or respond. Beyond prominent examples such as the Regent diamond, the complexities of aesthetic design — natural or artificial, brute or

brilliant — originated instead within the familiar "diamond in the rough," whose exceptional rationale was only made powerfully apparent upon closer inspection of its more mundane qualities.

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**Illustrations**

Fig.1.1: Sébastien Antoine, crown of Louis XV (1722), Musée du Louvre, Paris

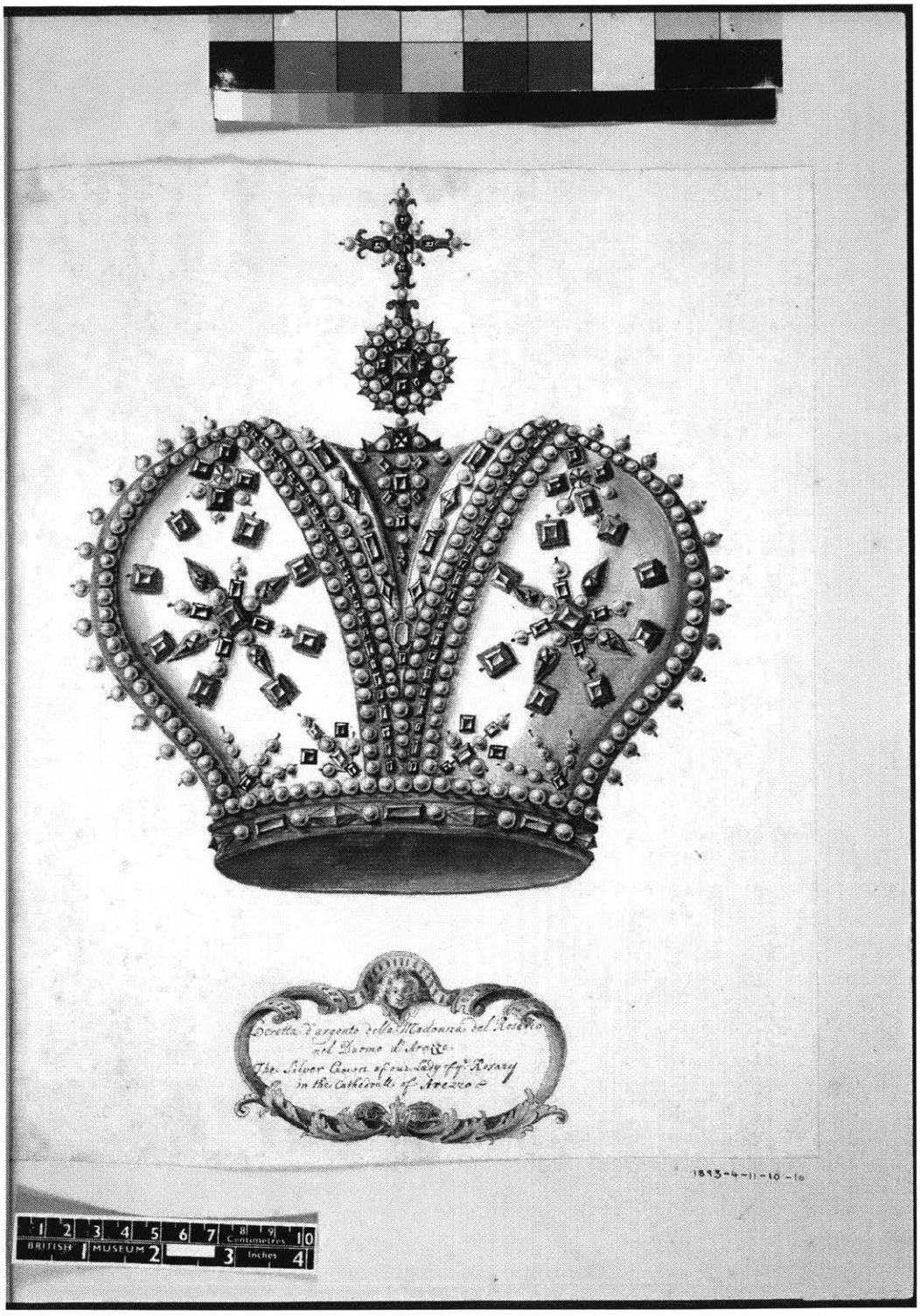
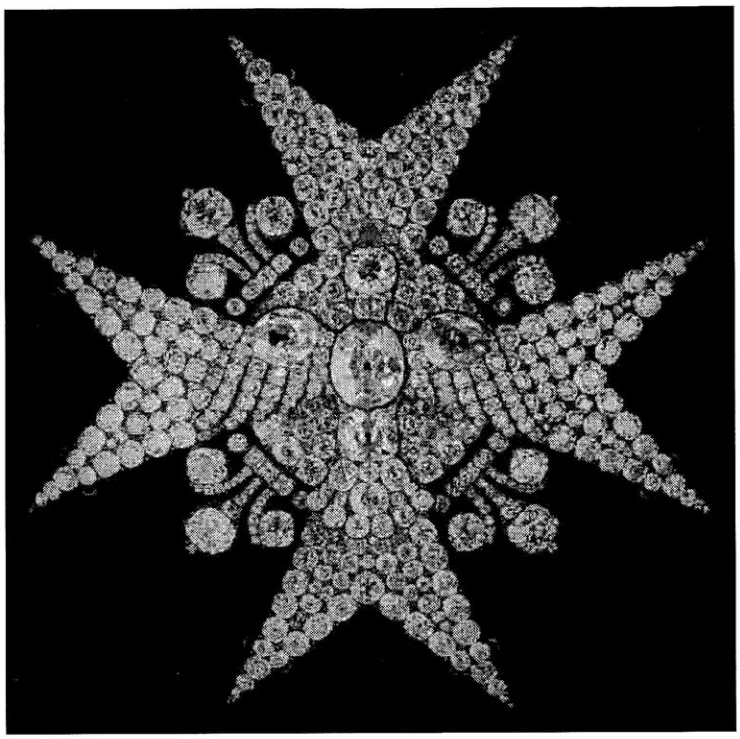


Fig. 1.2: Augustin Duflos and Claude Rondé, crown of Louis XV, 1722, MS 61, Musée du Louvre, Vitrine des diamants, Atlas database

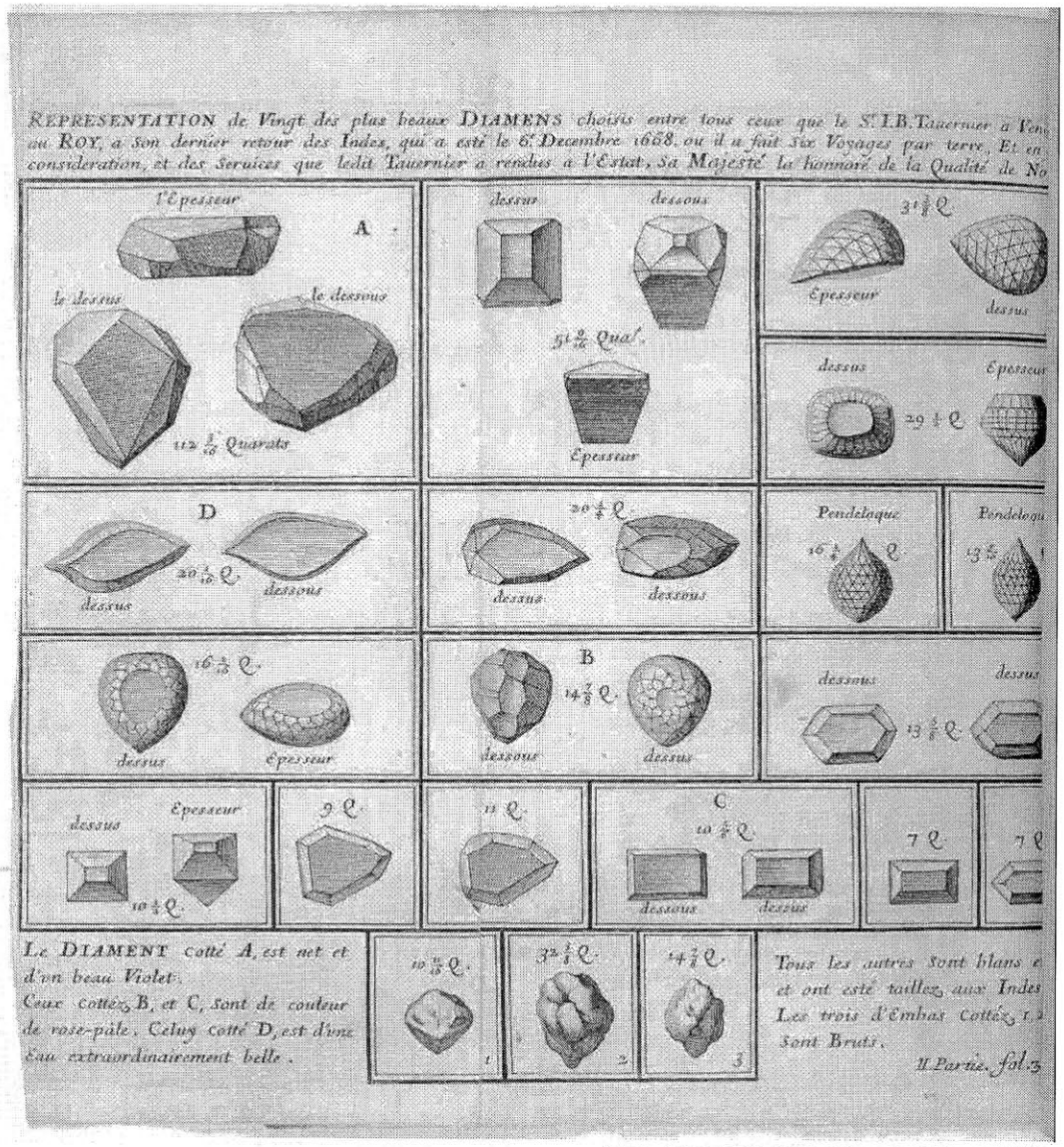
Fig. 1.3: Saint-Esprit Cross, Order of the Holy Spirit, 1736, OA 9527, Musée du Louvre, Department of Decorative Arts, Paris



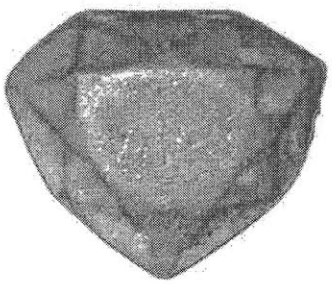
Anonymous, element for a necklace for the order of Saint Janvier, OA 6179, Italy 1738, Musée du Louvre, Department of Decorative Arts, Paris

Fig. 1.4: Antoine-François Callet, *Louis XVI* (1786), Musée Carnavalet, Paris

Fig. 1.5: Jean-Baptiste Tavernier, *Les six voyages de M. Tavernier*, 1676, Vingt des plus beaux diamants rapportés d'Inde, II partie, fol. 3, Bibliothèque nationale de France, Paris. A lead mold of the Bleu de Tavernier, measuring 31 x 26mm, discovered by François Farges at the Muséum national d'histoire naturelle (below)




Source gallica.bnf.fr / Bibliothèque nationale de France



Diamond facets diagram from dossier "Notes from the Koh-I-Noor and other famous diamonds," 1850-60, Natural History Museum, London

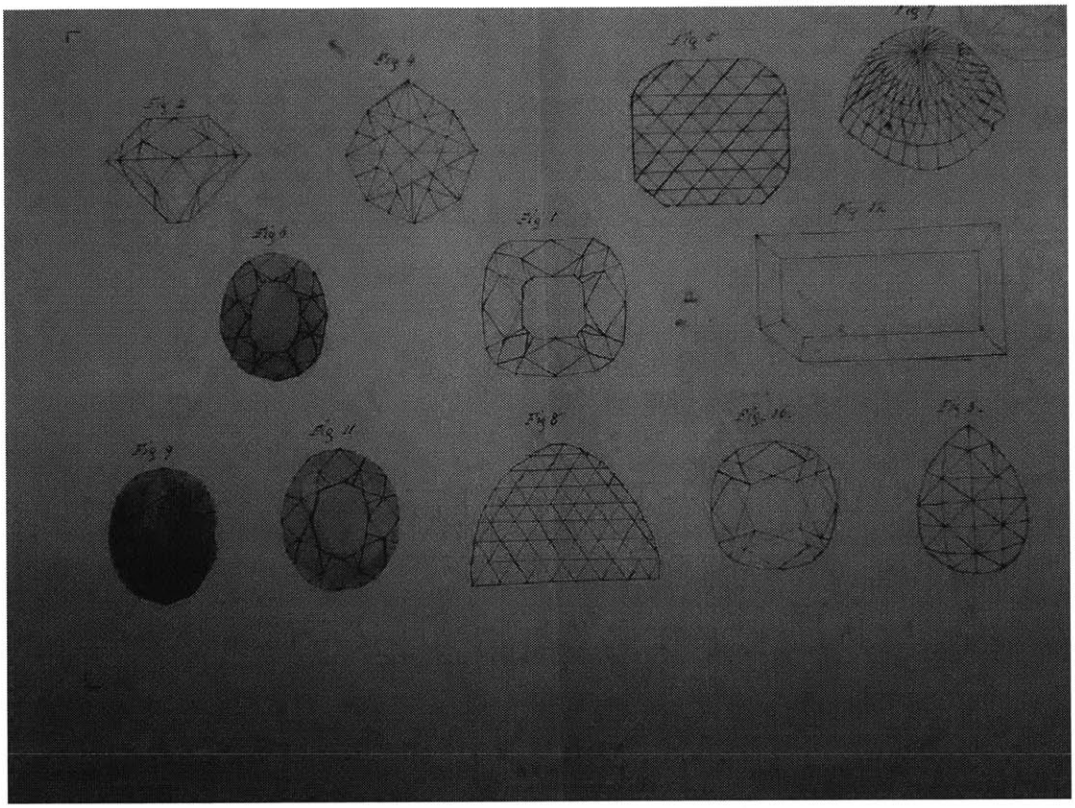


Fig. 1.6: Yellow diamond, MNHN 82141, Museum national d'histoire naturelle, Paris

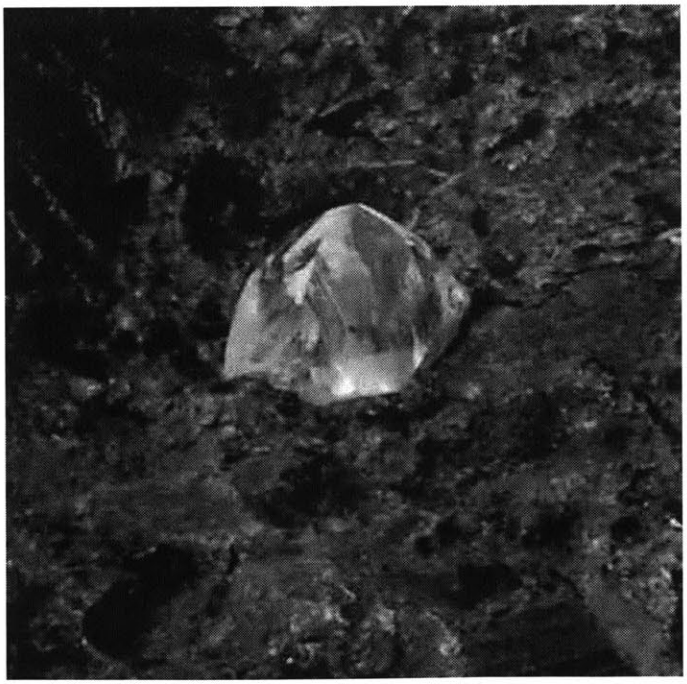


Fig. 1.7: Medicine cabinet belonging to Louis XIV, Museum national d'histoire naturelle, Mineralogy gallery, Paris, photo taken by author

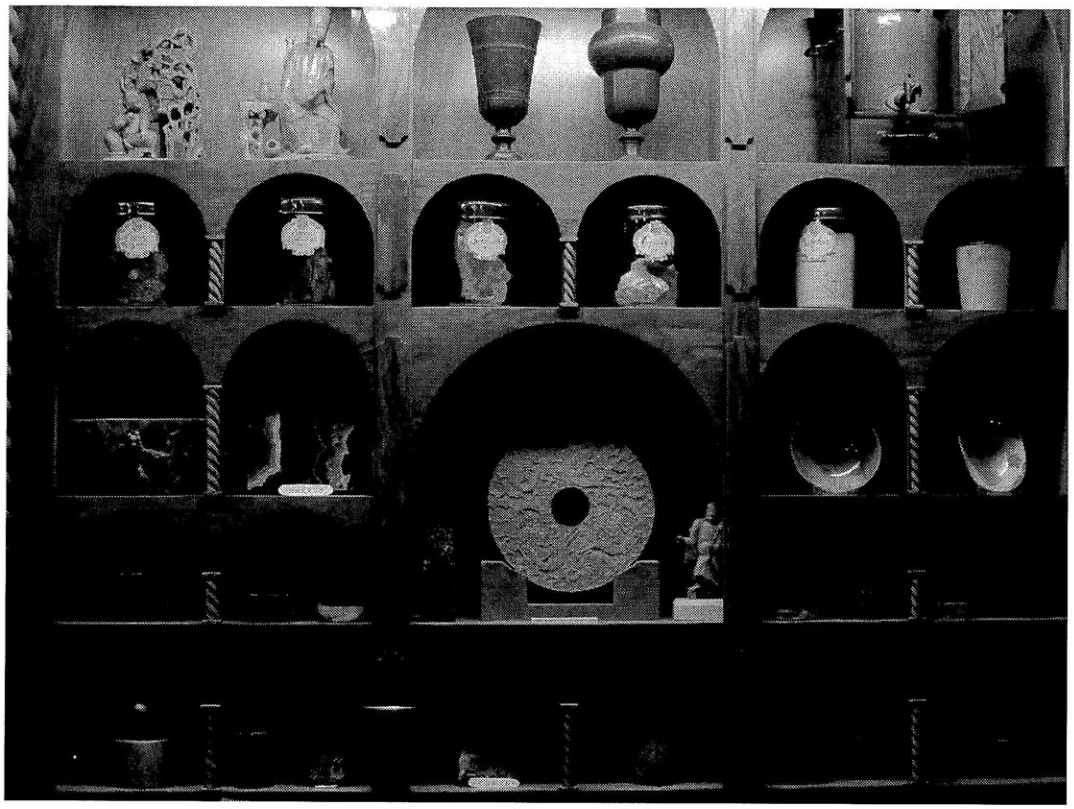
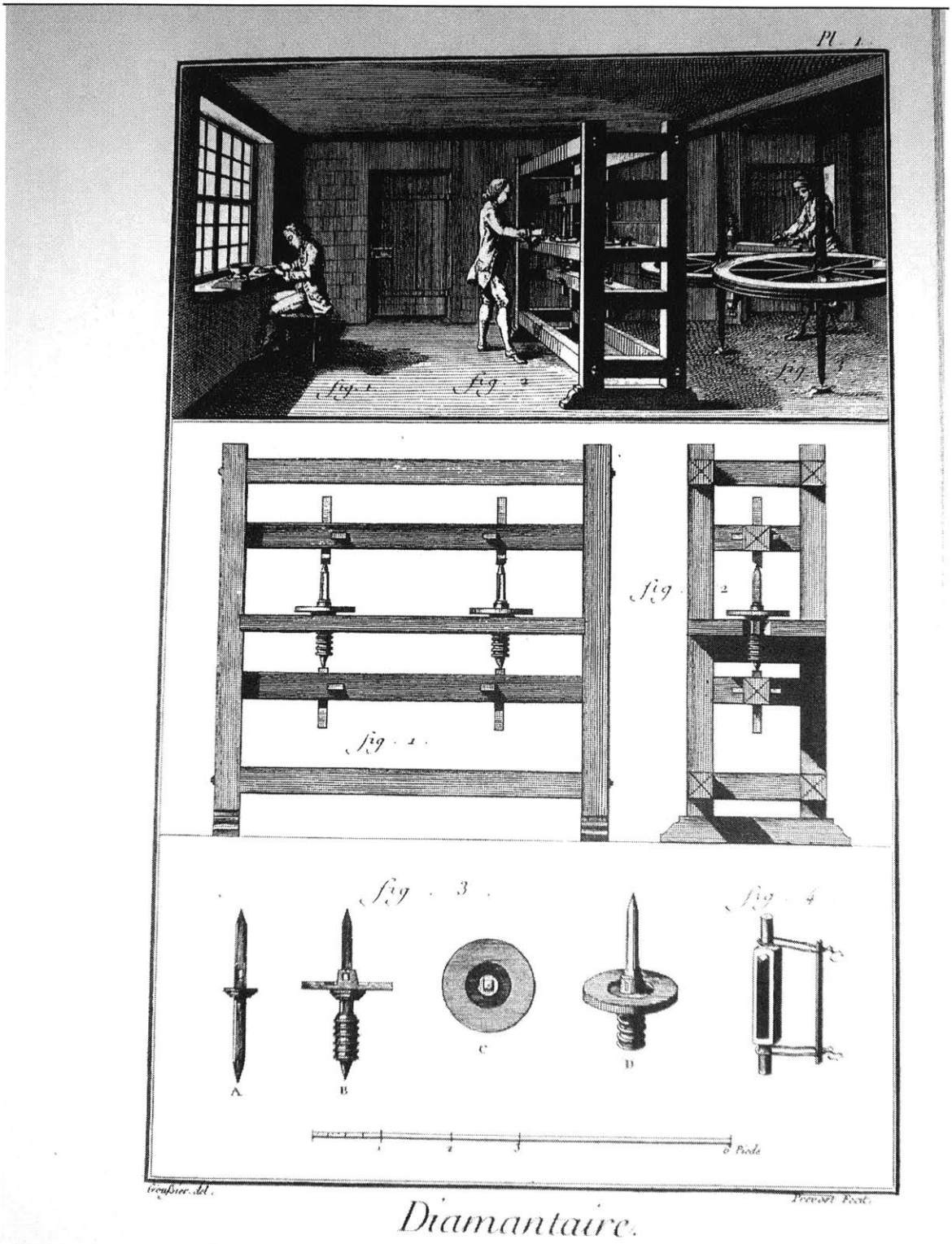


Fig. 1.8 and 1.9: Plates taken from Jean le Rond d'Alembert and Denis Diderot, *Encyclopédie*, 1751-1772, "L'atelier du tailler de diamants et de pierres précieuses"

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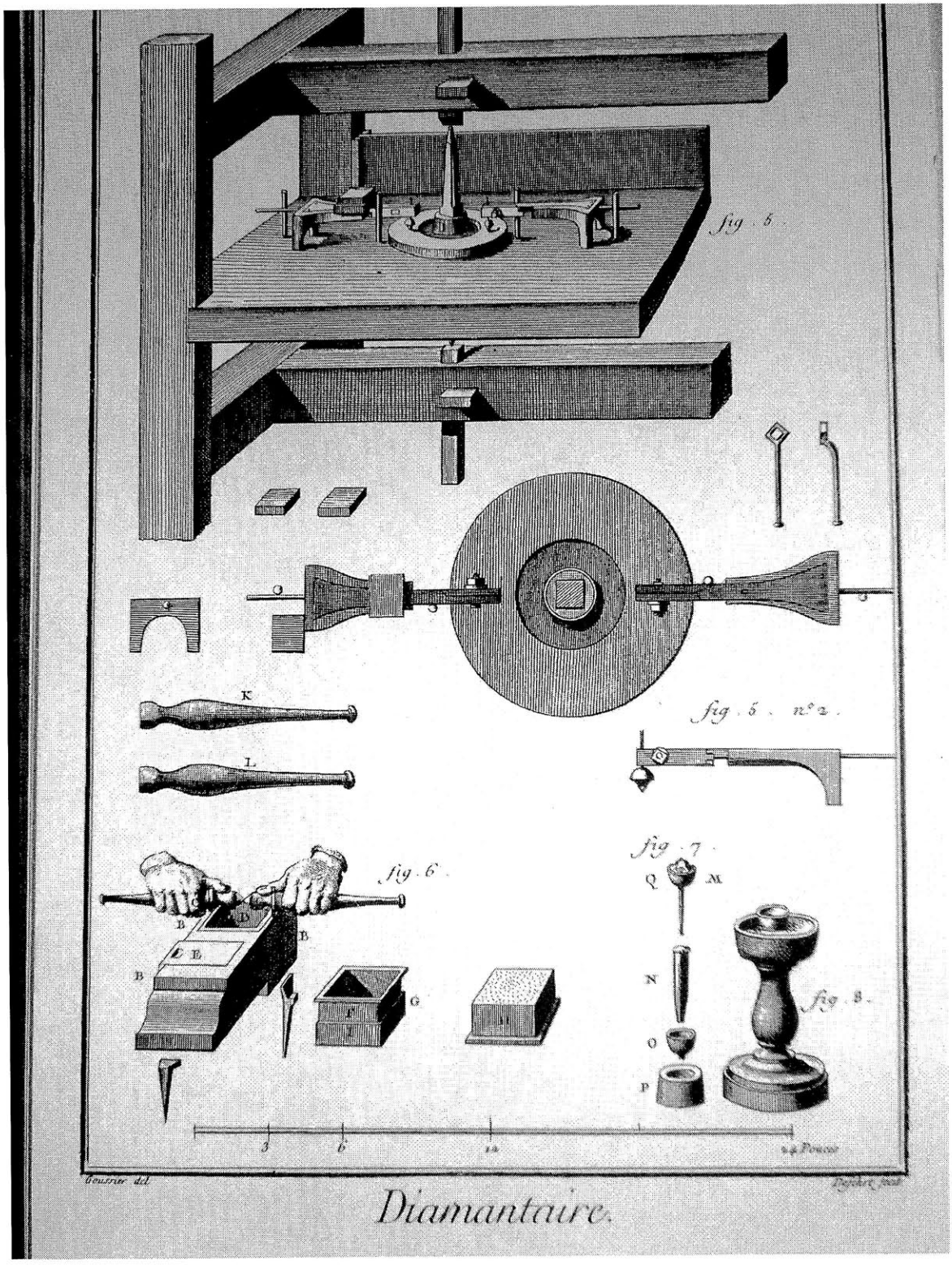
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John Hinton, view of a diamond cutter's shop, July 1749, London

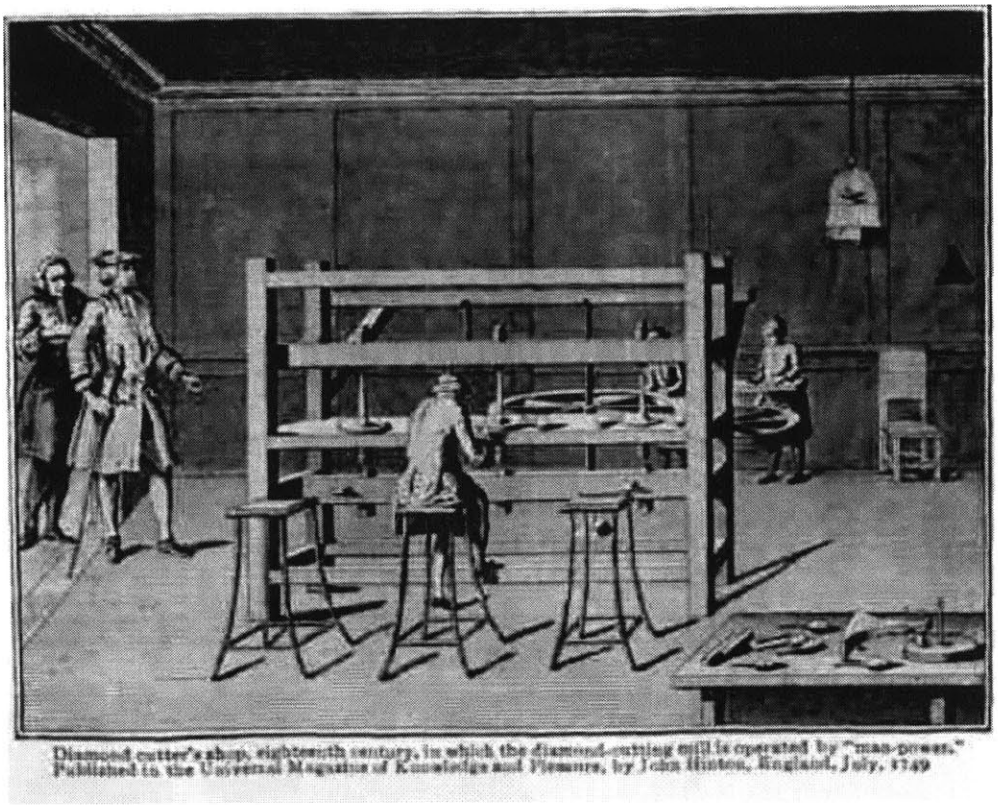
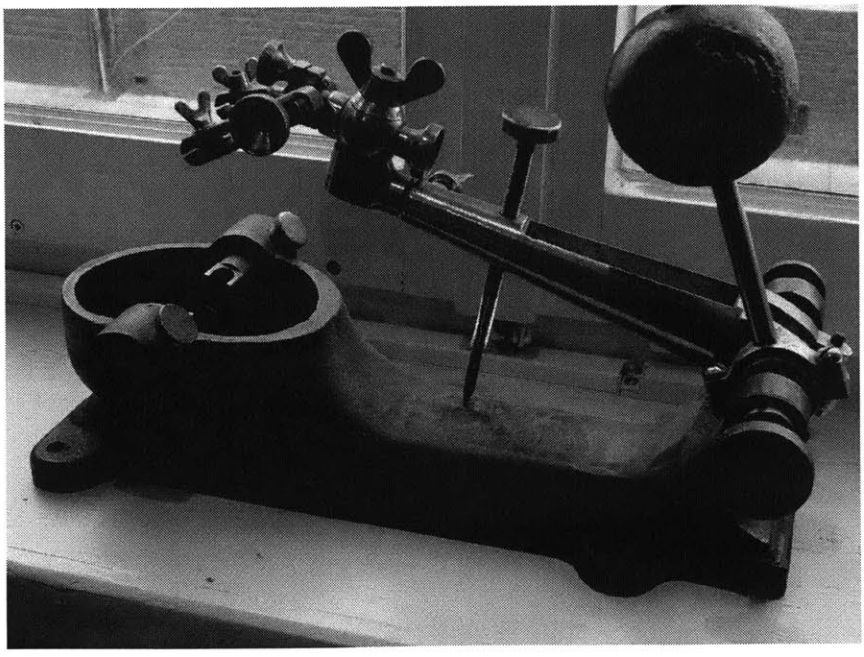
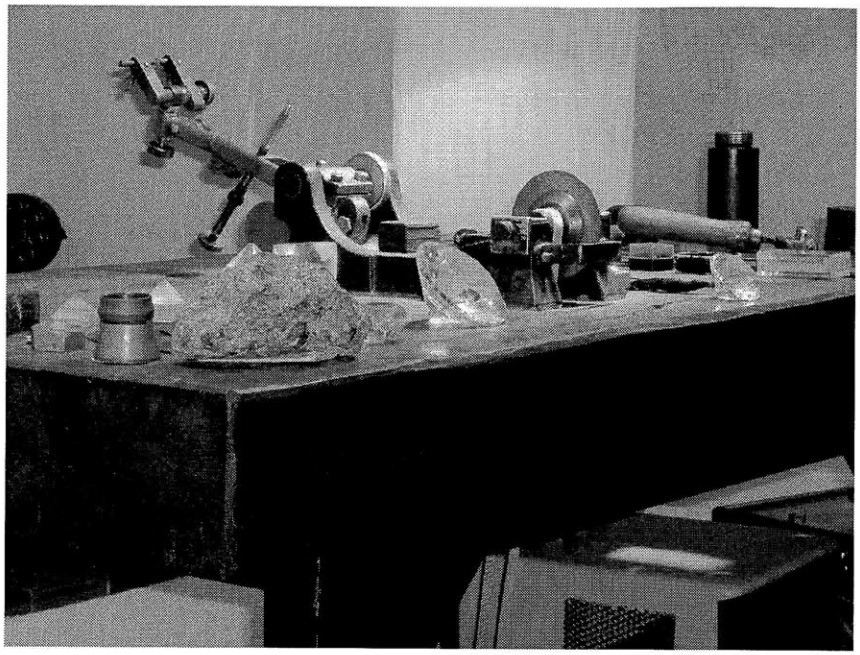
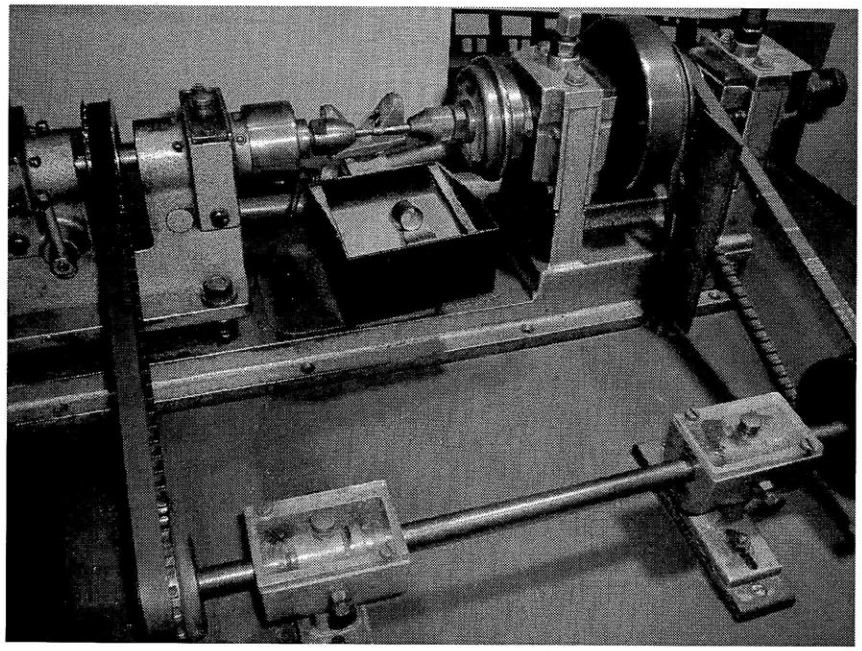


Fig. 1.10: Diamond cutting tools from the DiamondMuseum, Bruges, Netherlands, February 2009, photos taken by author







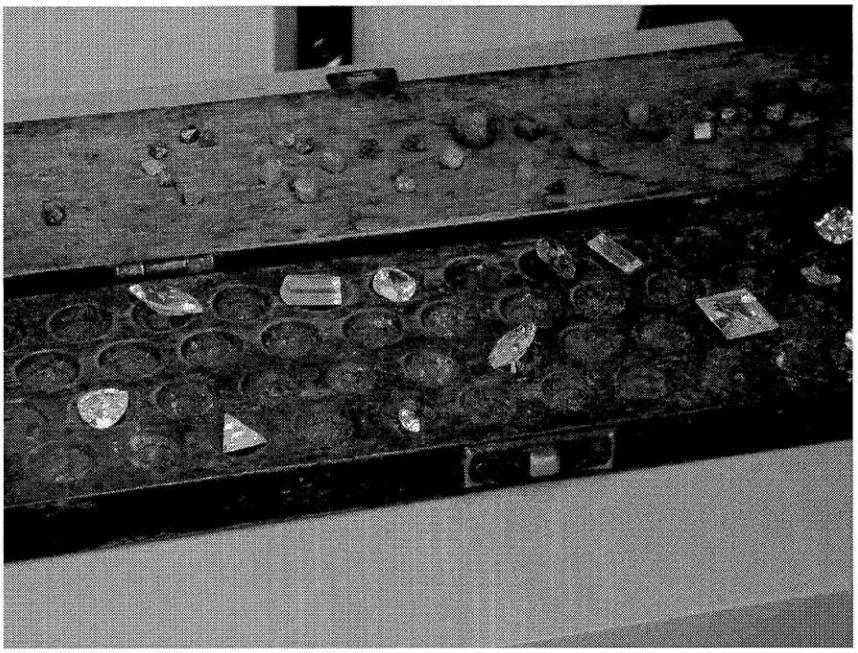
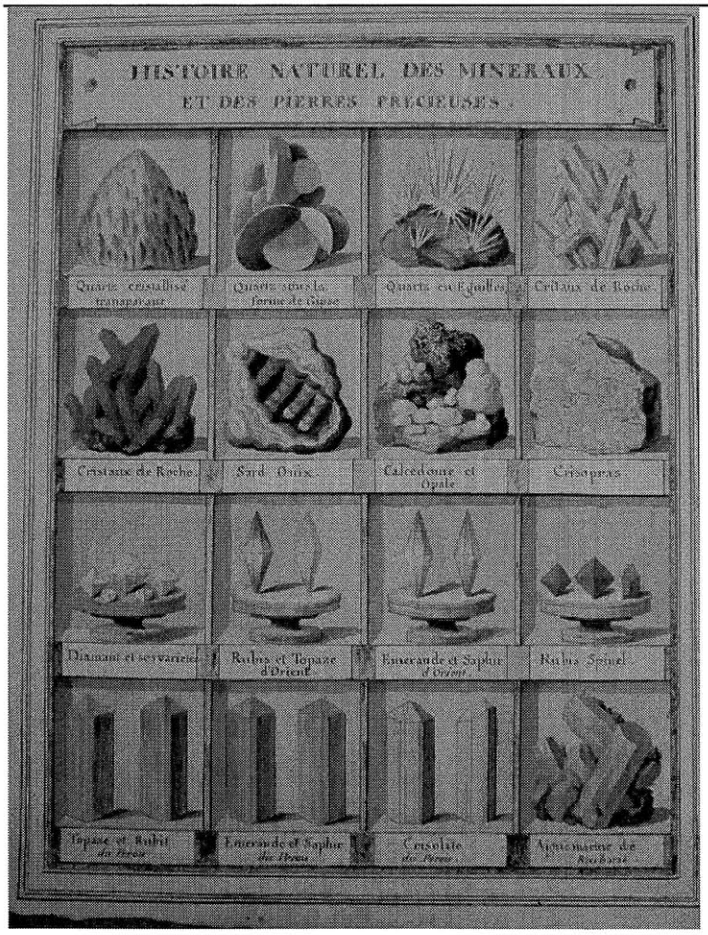


Fig 1.11 and 1.12: François-Louis Swébach Desfontaines, plates from *Histoire naturelle des mineraux et pierres précieuses*, 1789, Natural History Museum, London



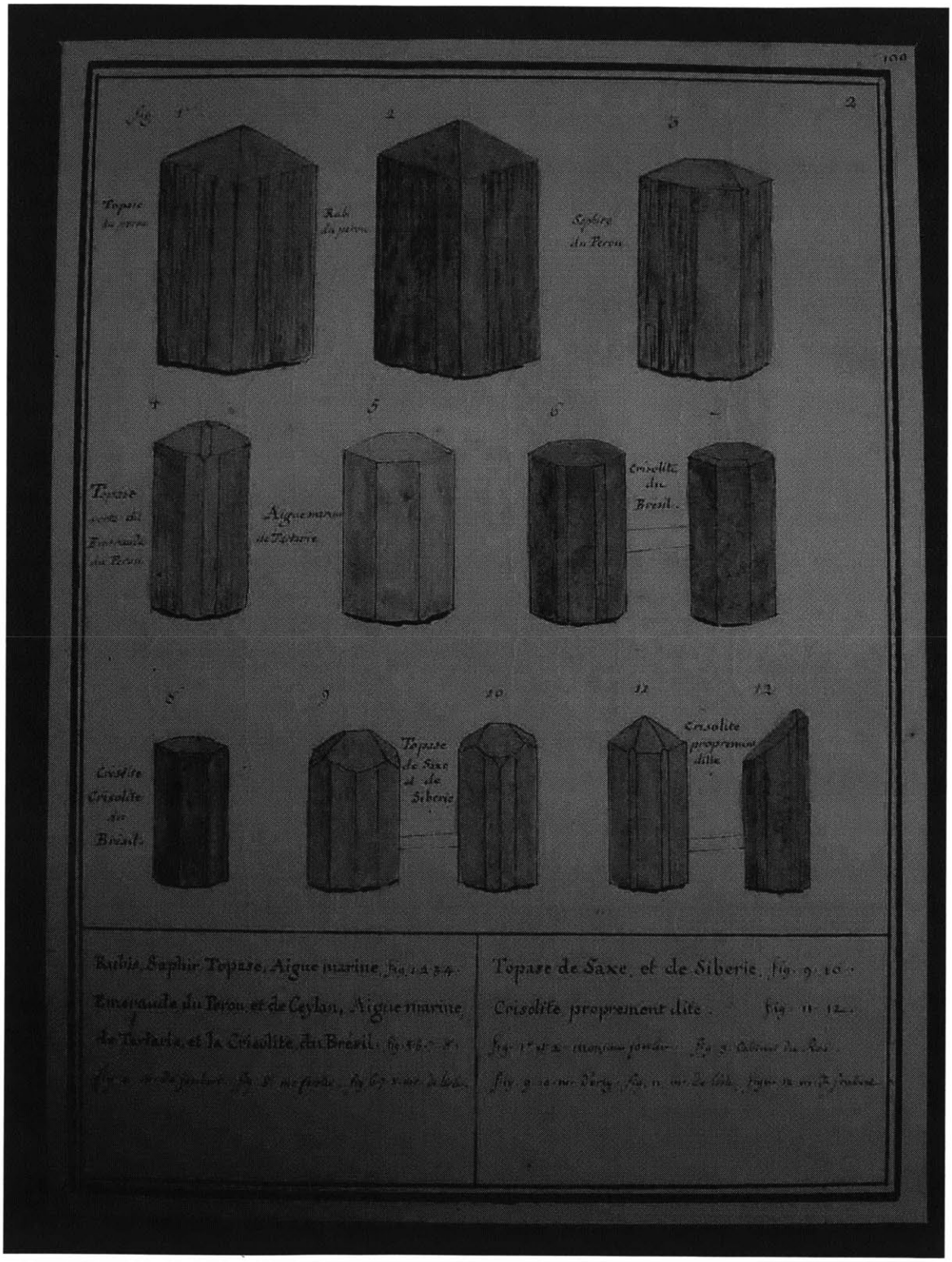

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Fig. 1
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Topaze du Perou
Rubi du perou
Saphir du Perou
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Topaze
Aigue marine de Tartarie
Crisolite du Brezil
8
9
10
11
12
Crisolite Crisolite du Brezil
Topaze de Saxe et de Siberie
Crisolite proprement dite
Rubis, Saphir, Topaze, Aigue marine, fig. 1, 2, 3, 4.
Topaze de Saxe, et de Siberie, fig. 9, 10.
Crisolite proprement dite. fig. 11, 12.

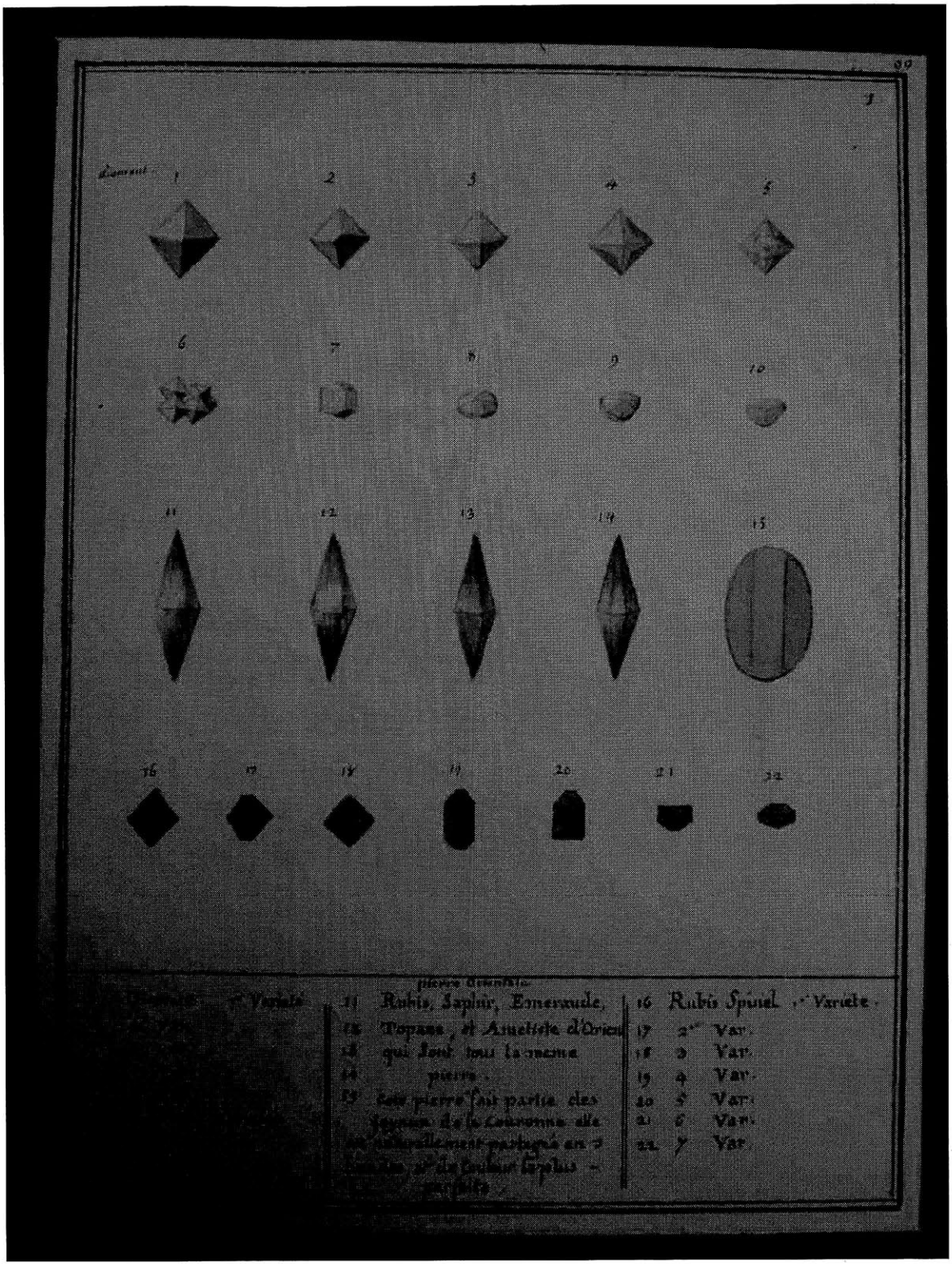

pierres d'emeris.
11 Rubis, Saphir, Emeraude,
12 Topaze, et Amethiste d'Orient
13 qui sont tous la meme
14 pierre.
15 Cette pierre est partie des
figures de la Couronne elle
est naturellement partagée en 2
16 Rubis Spinel 1.re Variete.
17 2.me Var.
18 3 Var.
19 4 Var.
20 5 Var.
21 6 Var.
22 7 Var.

Fig. 1.13: Noël Hardivilliers, gold tabatière, OA 6765, and Gabriel Gallois, gold tabatière, OA 7976, 1738, Musée du Louvre, Department of Decorative Arts, Paris

Fig. 1.14: François Delapierre, three-sided seal, M59-1962, n.d., Metalwork, Victoria & Albert Museum, London

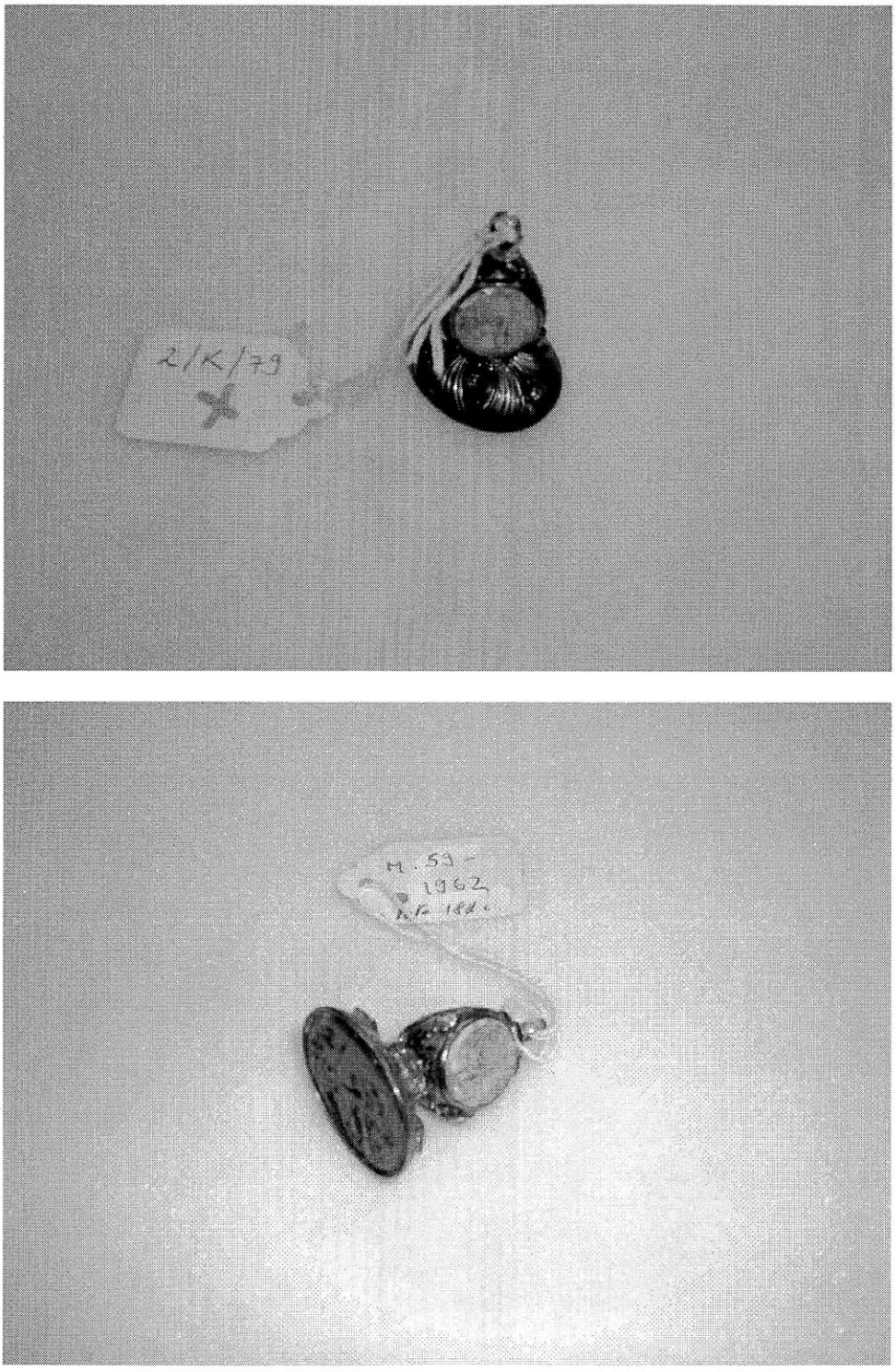


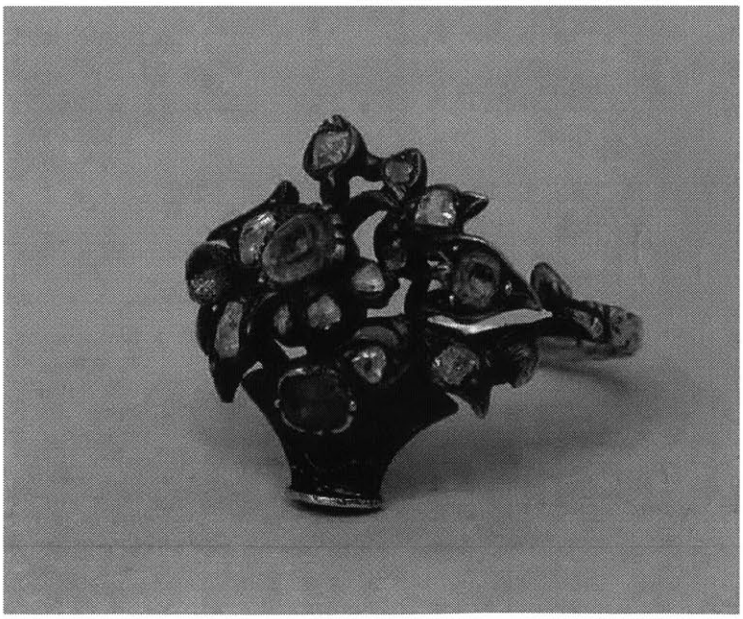
Fig. 1.15: Louis Dutens, Table du prix des diamants taillés from *Des pierres précieuses*, 1776

**TABLE DU PRIX DES DIAMANTS TAILLÉS.**

Le carat eſt de 4 grains.

| carats. | louis. | liv. | carats. | louis. | liv. |
|---|---|---|---|---|---|
| 1 | 8 | | 7 ¾ | 480 | 12 |
| 1 ¼ | 12 | 12 | 8 | 512 | |
| 1 ½ | 18 | | 8 ¼ | 544 | 12 |
| 1 ¾ | 24 | 12 | 8 ½ | 578 | |
| 2 | 32 | | 8 ¾ | 612 | 12 |
| 2 ¼ | 40 | 12 | 9 | 648 | |
| 2 ½ | 50 | | 9 ¼ | 684 | 12 |
| 2 ¾ | 60 | 12 | 9 ½ | 722 | |
| 3 | 72 | | 9 ¾ | 760 | 12 |
| 3 ¼ | 84 | 12 | 10 | 800 | |
| 3 ½ | 98 | | 10 ¼ | 840 | 12 |
| 3 ¾ | 112 | 12 | 10 ½ | 882 | |
| 4 | 128 | | 10 ¾ | 924 | 12 |
| 4 ¼ | 144 | 12 | 11 | 968 | |
| 4 ½ | 162 | | 11 ¼ | 1012 | 12 |
| 4 ¾ | 180 | 12 | 11 ½ | 1058 | |
| 5 | 200 | | 11 ¾ | 1104 | 12 |
| 5 ¼ | 220 | 12 | 12 | 1152 | |
| 5 ½ | 242 | | 12 ¼ | 1200 | 12 |
| 5 ¾ | 264 | 12 | 12 ½ | 1250 | |
| 6 | 288 | | 12 ¾ | 1300 | 12 |
| 6 ¼ | 312 | 12 | 13 | 1352 | |
| 6 ½ | 338 | | 13 ¼ | 1404 | 12 |
| 6 ¾ | 364 | 12 | 13 ½ | 1458 | |
| 7 | 392 | | 13 ¾ | 1512 | 12 |
| 7 ¼ | 420 | 12 | 14 | 1568 | |
| 7 ½ | 450 | | 14 ¼ | 1624 | 12 |

Fig. 1.16 and 1.17: Bague panier fleuri, France 18e siècle, 19736; Epingle à cheveux, France 18e siècle, 4194 A, Musée des arts décoratifs, Galerie de Bijoux, Paris



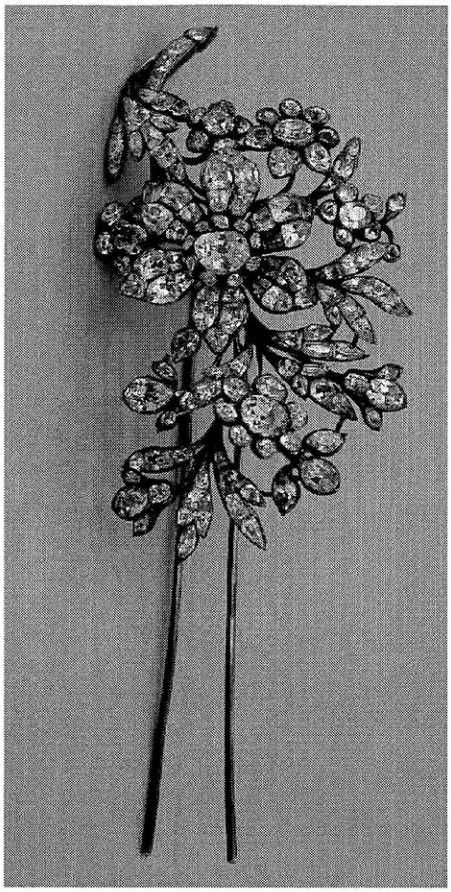
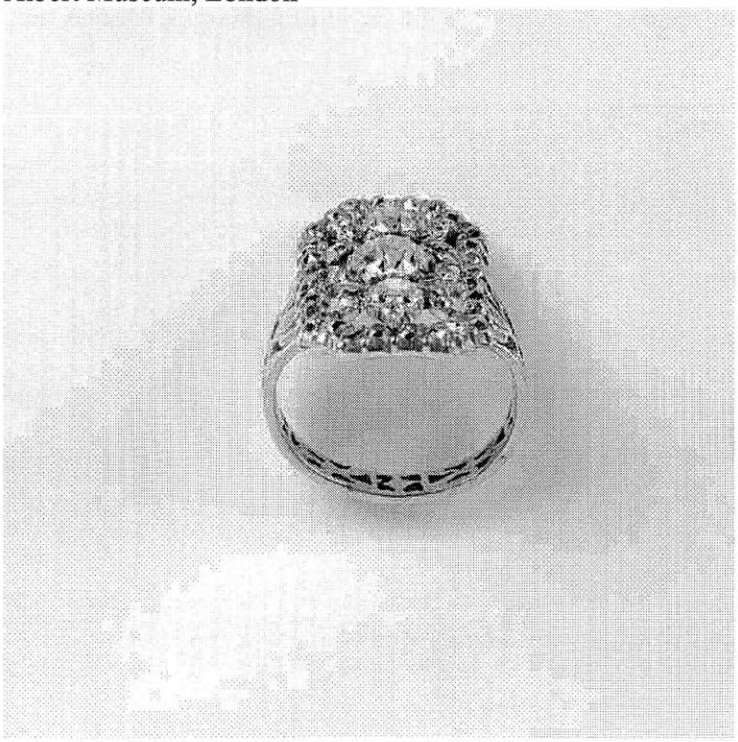


Fig. 1.18: Anonymous, diamond ring, France c. 1775-1825, M.215-1962, Metalwork, Victoria & Albert Museum, London



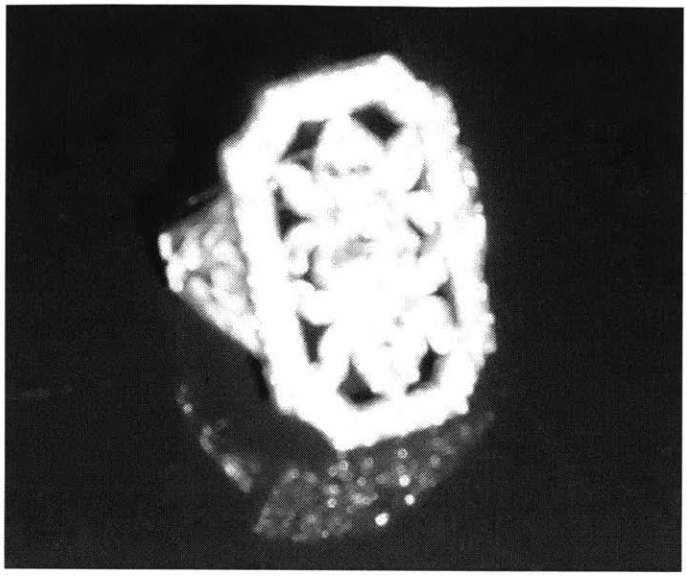


Fig. 1.19: Anonymous, dove brooch, France c. 1755, M.56-1962, Metalwork, Victoria & Albert Museum, London

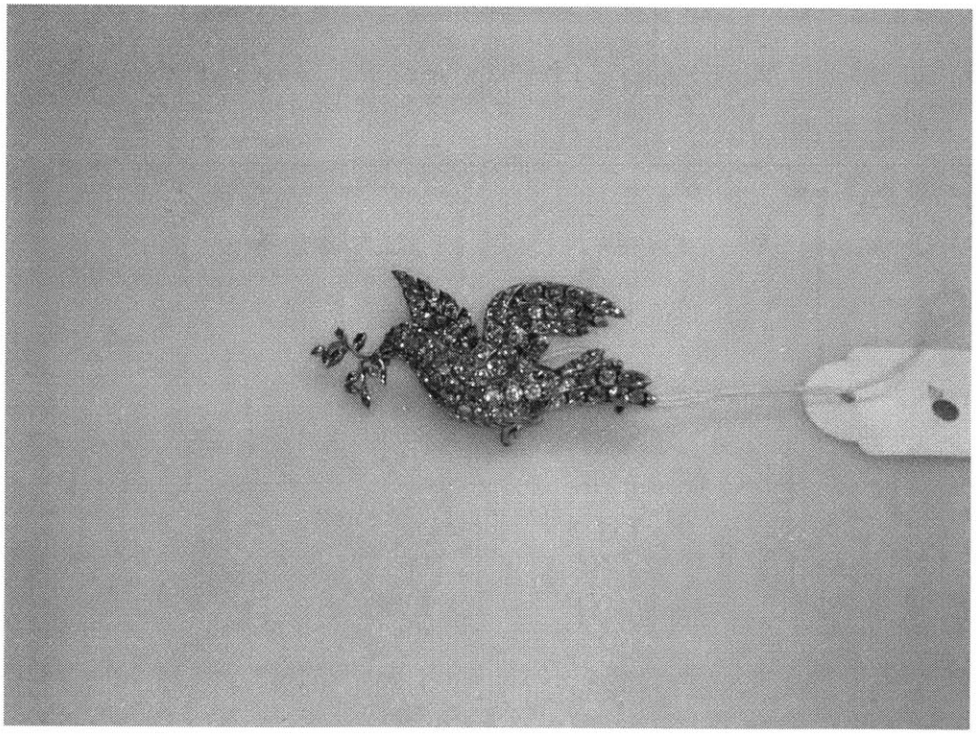
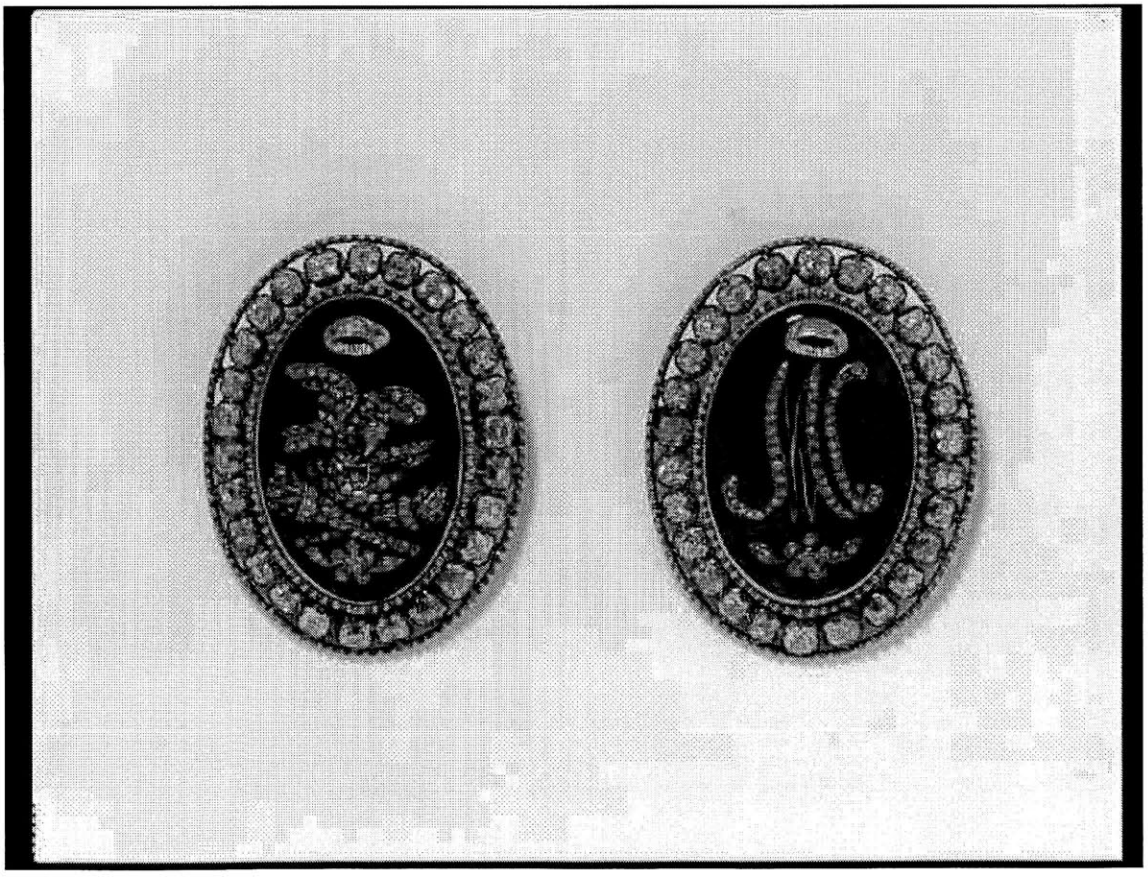
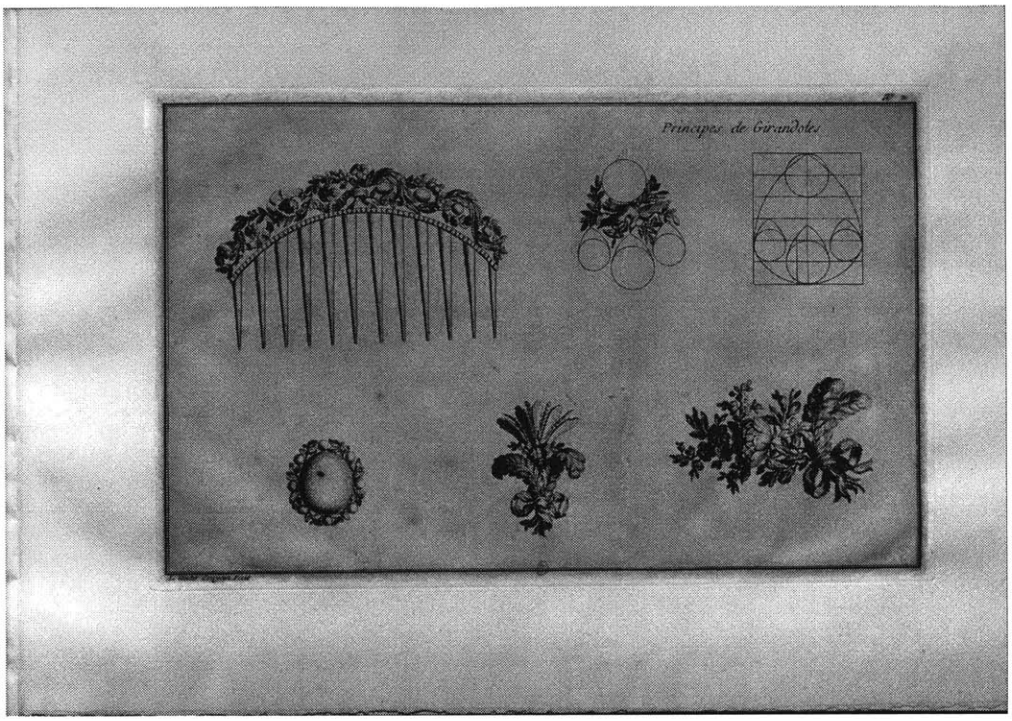



Fig. 1.20: Anonymous, bracelet clasps, France c. 1770, M.51&A-1962, Metalwork, Victoria & Albert Museum, London



Folio EST 385, Designs for pearl earrings and hair combs ?, Fonds patrimoniaux, Bibliothèque Institut national d'histoire de l'art (INHA), Paris



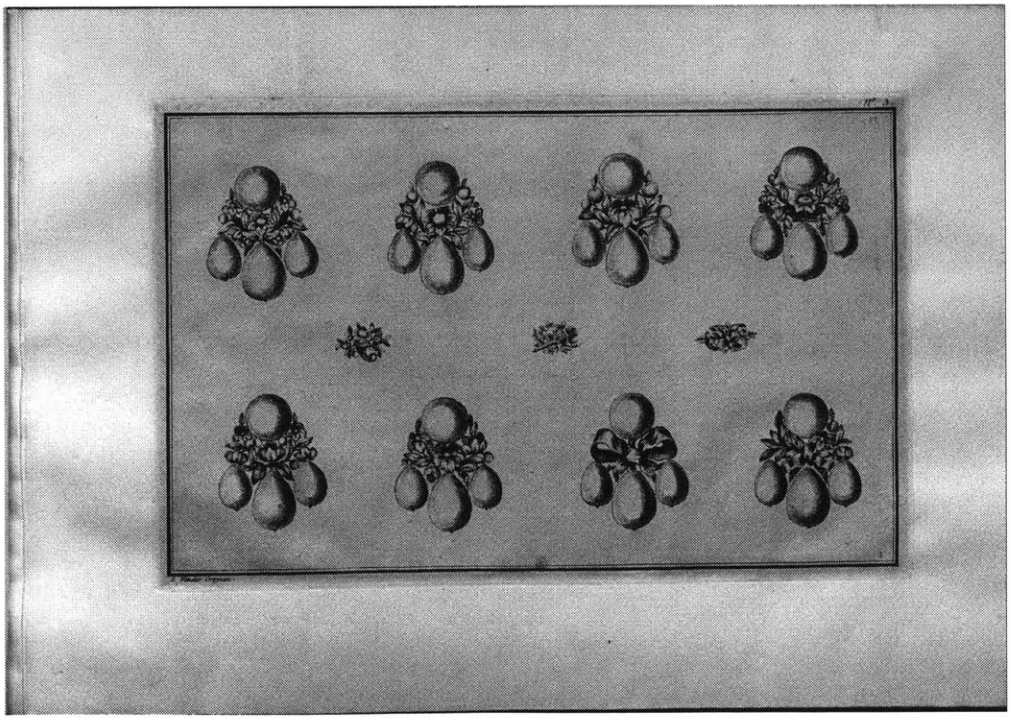
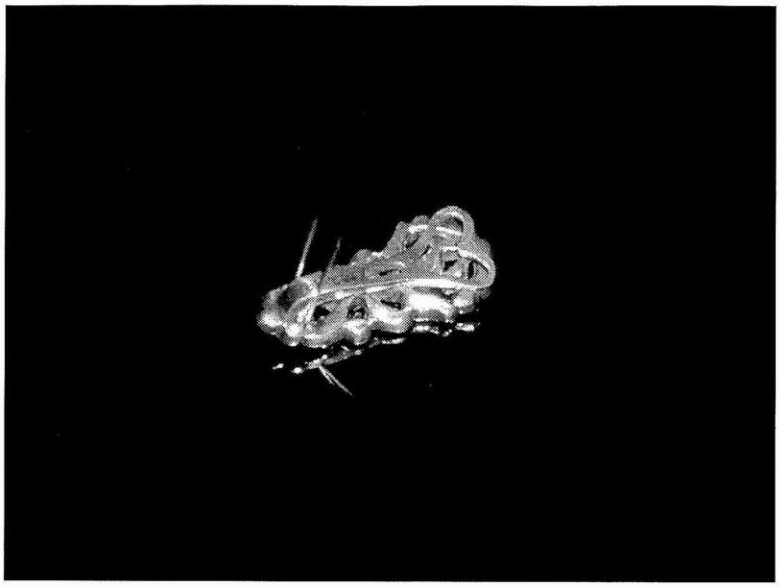



Fig. 1.21: Pouget-inspired paste jewelry brooch, n.d., Metalwork, Victoria &Albert Museum, London



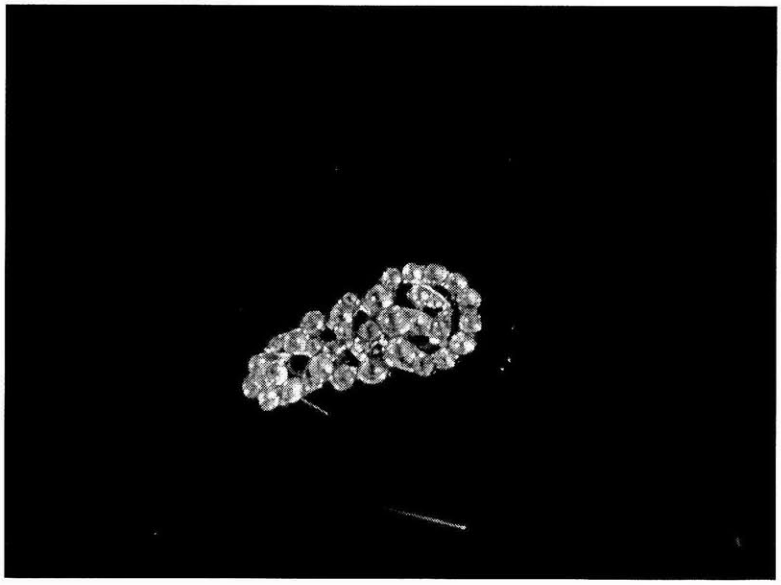
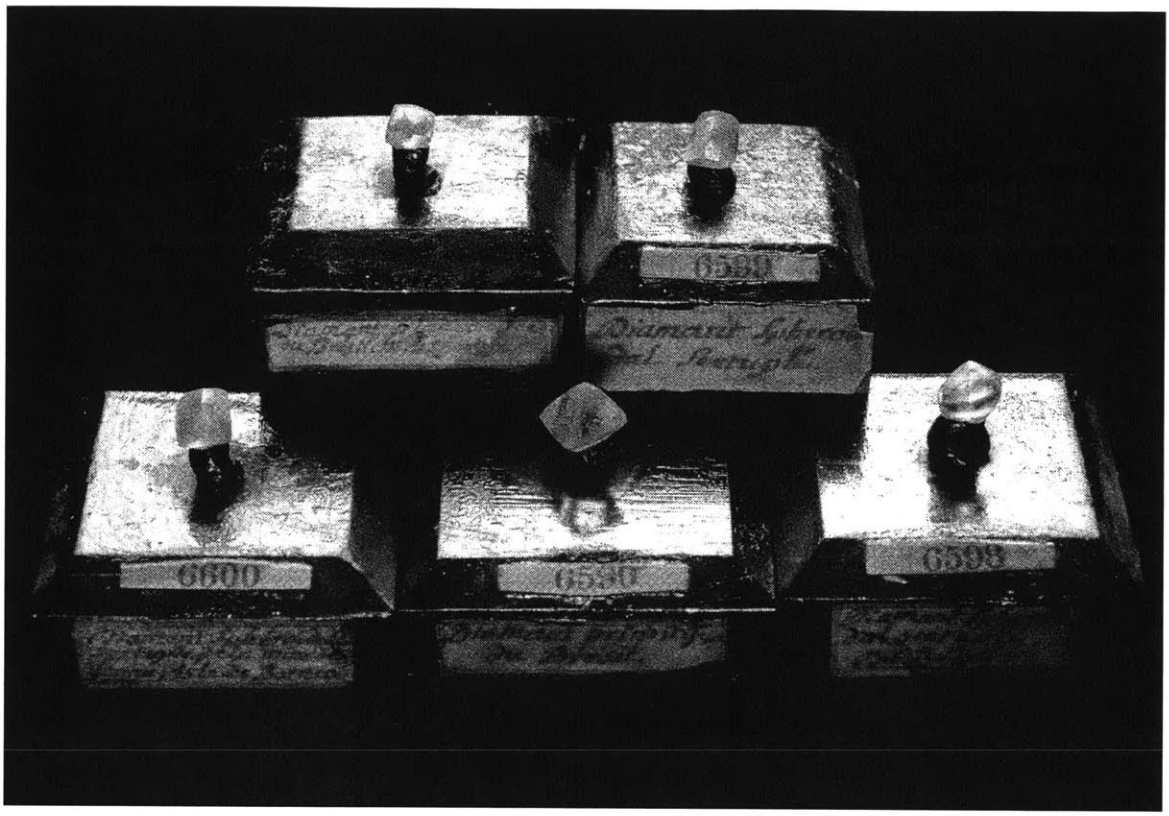


Fig. 1.22: René-Juste Haüy, specimens of diamonds mounted onto wood bases, Muséum national d'histoire naturelle, Paris



[1] Germain Bapst, *Histoire des joyaux de la couronne de France, d'après des documents inédits: ouvrage orné de 50 gravures* (Paris: Hachette, 1889): 443-445. Bapst's history of the crown jewels was cited in many other texts and republished, for instance, in Edouard Rott's *Histoire des joyaux de la couronne de France*. Refer also to Bapst, *Études sur l'orfèvrerie française au XVIIIe siècle. Les Germain, orfèvres sculpteurs du roy* (Paris: J. Rouam, 1887) and Bernard Morel, *Les joyaux de la Couronne de France: les objets du sacre des rois et des reines suivis de l'histoire des joyaux de la couronne de Francois Ier à nos jours* (Paris: Albin Michel, 1988).

[2] Adrian Goetz and Claudette Joannis, *Jewels in the Louvre* (Paris: Musée du Louvre and Flammarion, 2008): 45. On royal diamonds, see Stéphane Castelluccio, *Les collections royales d'objets d'art de François Ier à la Revolution* (Paris: Les éditions de l'Amateur, 2003), Gérard Mabille, *Les diamants de la couronne* (Paris: Gallimard, 2004), and Danielle C. Kinsey, "Koh-I-Noor: Empire, Diamonds and the Performance of British Material Culture" in *The Journal of British Studies*, Vol. 48, No. 2, special issue on Material Culture (April 2009): 391-419. The exposition *Diamants, au coeur de la Terre, au coeur de Pouvoir* was held at the Museum national d'histoire naturelle from March 10, 2001 – July 29, 2001 in Paris.

[3] Ibid., 47.

[4] For drawings of jewelry designs that were not prominent commissions of the late eighteenth century, see Augustin-Pierre Duflos, *Recueil de dessein de joaillerie: dedie à Monseigneur le comte de Saint-Florentin* (1767), Bibliothèque des arts décoratifs, Paris, Maciet ORN/3/69-86; Jean-Baptiste Fay, *Cahier du Bijouteries dans le gout moderne*, Bibliothèque des arts décoratifs, Paris, Maciet ORN/5/5-10 and *Cahier de bijouteries dans le gout moderne* (Paris: n.d.) in Institut national d'histoire de l'art (INHA) archives, Paris, Fol Est 520; L. Van der Cruycen, *Nouveau livre de desseins contenant les ouvrages de la joaillerie* (Paris: 1770), INHA archives, Paris, Fol Est 385.

[5] Louis Marin, "Mimesis and Description," in *On Representation*, translated by Catherine Porter (Stanford: Stanford University Press, 2001): 252-268, 255-256.

[6] Ibid., 255. Mimetic representations, for Marin and Plato, were considered lesser beings in relation to their models. The act of representing substitutes a present entity for an absent one, a type of regulated substitution. It is the postulated similarity between the present entity and the absent one that authorizes the act of substitution.

[7] James R. Johnson, "Stained Glass and Imitation Gems" in *The Art Bulletin*, Vol. 39 No. 3, (September 1957): 221-224, 224. Refer also to Jean Haudicquer de Blancourt, who concocted realistic eyeballs from colored glass, *L'Art de la verrerie...nouvelle édition, augmentée d'un traité des pierres précieuses* (Paris: C. Jombert, 1718). His recipes were supposedly copied from Florentine priest Antonio Neri's earlier Italian

treatise *The Art of Glass, wherein are shown the waves to make and colour Glass, Pastes, Enamels, Lakes, and other Curiosities* (1612).

[8] Simon Schaffer, "Experimenters' Techniques, Dyers' Hands, and the Electric Planetarium" in *Isis*, Vol. 88, No. 3 (September 1997): 456-483, 458-9. Employing Otto Sibum's concept of "gestural knowledge" Schaffer grants that embodied competences could take on the status of philosophy, connecting experimental labor to the history of craft techniques. Under the old regime, labor was cursed while art was held as noble; the hand signified a "metonymic sign of distinction, communication, and work" (459).

[9] Maurice Robert, *Les artisans et les métiers*, CNRS (Paris: Presses Universitaires de France, 1999). On the history of artisans and corporations, refer to Étienne Boileau, *Le livre des métiers (règlemens)* (Paris: Édition Depping, 1837); Robert Fox and Anthony John Turner, eds. *Luxury Trades and Consumerism in Ancient Regime Paris: Studies in the History of Skilled Workforce* (Variorum, 1998); Jean-Michel Gourdon, *Gens de métier et sans-culottes: les artisans dans la Révolution* (Paris: Éd. Créaphis, 1988); Jean-Paul Mazaroz, *Histoire des corporations françaises d'arts et métiers*, second edition (Paris: Germer Baillière, 1878); Jacques Revel, "Les corps et communautés," in K.M. Baker, ed., *The political culture of the Old Regime* (Oxford: Pergamon Press, 1987): 225-242; Étienne Martin Saint-Léon, *Histoire des corporations et métiers: depuis leurs origines jusqu'à leur suppression en 1791: suivie d'une étude sur l'évolution de l'idée corporative au XIXe siècle et sur les syndicats professionels* (Paris: F. Alcan, 1922); Carolyn Sargentson, *Merchants and Luxury Markets: The Marchands Merciers of 18th Century Paris* (London: V&A Museum, 1996); William Sewall, *Work and Revolution in France: The Language of Labor from the Old Regime to 1848* (Cambridge: Cambridge University Press, 1980).

[10] *Pierre Le Roy's Statuts et Privileges du Corps des Marchands Orfevres-Joyailliers de la Ville de Paris* (Los Angeles : J. Paul Getty Museum, 2003 [1759]): Titre XII. « De la Visite & Inspection des Maîtres & Gardes de l'Orfévrerie-Joyaillierie de Paris, Visite sur les Maistres Lapidaires » (1549), 199-200.

[11] Earlier works translated into French from the Dutch such as Anselme Boece de Boodt's, *Le parfait joaillier ou Histoire des pierreries: où sont amplement descrites leur naissance, juste prix, moyen de les connaître, et de les garder des contrefaits, facultez médicinales, et propriétés curieuses,1600-1700* (Lyon: J.A. Hugetan, 1644) addressed the character of false diamonds and why true diamonds were able to receive certain types of tinted coloration.

My interest in diamonds flourished through some correspondence with historian of science Robert Proctor at Stanford University, whose essay in the journal *Configurations* "Anti-Agate: The Great Diamond Hoax and the Semiprecious Stone Scam," provides a contemporary outlook on diamonds. Proctor is interested in agates and the recreational rockhound collectors who covet them, see "The Agateer," Online Research, Penn State, Sept. 2001, vol. 22, issue 3, http://www.rps.psu.edu/0109/agateer.html.

[12] François Crouzet, *Britain, France and international commerce: from Louis XIV to Victoria* (Aldershot: Variorum, 1996): 266.

[13] Victoria Finlay, *Jewels: A Secret History* (New York: Ballantine Books, 2006): 326-327. See Paul Micio, "Les collections d'orfèvrerie, de bijoux et d'objets d'art de Monsieur, frère de Louis XIV, et de sa famille (1625-1725)," Université de Paris IV, Sorbonne, thèse dirigée par Michèle Bimbenet-Privat, soutenue le 14 mars 2009. The Orléans family archives are translated for the first time along with fifteen inventories of silverware and a glossary of silver types. He includes lists of silversmiths, jewelers, and watchmakers, who worked for the family.

[14] Le Roy, Title VI, Article XV, ne teindre, ni autrement déguiser les Pierres (1387), 133-135.

[15] Le Roy, Titre VI, Des Devoirs des Maîtres & Marchands Orfévres-Joyailliers dans la profession de leur Art, Article XIV, « Ne mettre en oeuvre Pierres fausses avec Fines, &c., » (1679): 132-133.

[16] Many other medieval legislative documents found at the Archives Nationales tracked what types of precious stones and decorative items could be sold in areas such as fairgrounds and marketplaces. Some of the documents highlighted here are only representative of this large body of literature.

[17] Le Roy, Titre XIII, Des Reglemens de l'Orfévrerie à l'égard de ceux qui ne sont point Orfévres. Article VIII, « Commerce de la Pierrerie hors d'oeuvre, libre aux Orfévres & Lapidaires » (1613): 216.

[18] Le Roy, Title XIII, Article IX, Lapidaires, ni Orfévres, ne seront Facteurs de Marchands étrangers (1631): 217.

[19] Le Roy, Title XIII, Article X, Lapidaires ne vendront Pierrerie montée en œuvre (1631): 217.

[20] Ibid, 218. See Arrêt de la Cour de Parlement, 6 Septembre 1631.

[21] Le Roy, Title XIII, Article XI, Lapidaires ne mettront Pierrerie en oeuvre, 219-220.

Et en cas de contravention, les Parties se pourvoiront pardevant le Prevôt de Paris, & par appel au Parlement...Layette 15, cotte 32. Item. Recueil, pag. 650. Voyez sur cette affaire les cottes depuis 24, jusqu'à 32 de cette Layette; & les Mémoires & Procedures dans le Sac, no. 19.

[22] *Nouveaux Statuts et Réglements de la Communauté des Maîtres & Marchands Lapidaires-Diamantaires, Jouailliers de la Ville, Fauxbourgs & Banlieue de Paris,*

*rédigés & arrêtés en l'Assemblée des Maîtres, le 4 Juin 1763, revetûs de Lettres Patentes du 2 Mars 1768, enregistrées au Parlement de Paris le 2 Decembre suivant.* 23rd title, first article, ordained by Arrêt du Conseil, June 19, 1768, p.67. Refer to Natacha Coquery, "The Language of Success: Marketing and Distributing Semi-Luxury Goods in Eighteenth-Century Paris" in *Journal of Design History* 17 (2004): 71-89.

Refer also to *Liste de maîtres et marchands lapidaires-diamentaires-joailliers-metteurs-en-oeuvres* (1779).

[23] Colin Jones, *The Great Nation: France from Louis XV to Napoleon,* (New York: Columbia University Press, 2002): 174. Nicknamed the "Diamond Necklace Affair," the political scandal involving Marie-Antoinette (1784-1785) had caused public sentiment to turn against Louis XIV, despite his best efforts to quell the growing tide of furor that shadowed his queen's reputation. Disliked by Marie Antoinette, Louis Rohan, Grand Almoner to the king and cardinal bishop of Strasbourg, was deceived by Jeanne de Saint-Rémy de Valois, who had hired a prostitute named Nicole Leguay d'Oliva to dress as the queen. She signaled to the cardinal that she had forgiven him for their past disagreements at a secretly arranged meeting in one of the gardens at the Palace of Versailles. La Motte then extorted large sums of money from Rohan, who had mistakenly agreed to provide the so-called queen with available money to purchase a diamond necklace, originally designed for Madame Barry, held by the jewelers Boehmer and Bossange. The fraudulent trickery behind this surreptitious deal was exposed when Bossange requested Marie-Antoinette to pay the first installment due on the necklace. The queen noticed that her signature on the invoice was evidently forged in another person's handwriting. The diamond necklace, however, by this time, had been dismantled, with approximately 500 stones sold on the black market (336-37).

[24] Jean le Rond d'Alembert and Denis Diderot, *Encyclopédie ou Dictionnaire raisonné des sciences, des arts et des métiers, par une Société de Gens de lettres* (Paris: Chez Briasson, David, le Breton, Durand, 1751-1772): 282.

[25] D'Alembert and Diderot, *Encyclopédie*, 4:941.

[26] Ibid., 938. See Henry Draper Steel (1756-1818), *The India officer's and trader's pocket-guide, in purchasing the drugs and spices of Asia and the East Indies: with practical directions for the choice of diamonds and an accurate account of the Chinese touch needles* (London: Printed for D. Steel, 1789), British Library, London; *Actes de la Société d'histoire naturelle de Paris* (Paris: Reynier, Prevost, et Amand-Koenig, 1792), "Diamans du Bresil" by M. d'Andrada: 78-80, Silvia Figueirôa and Clarete da Silva, "Enlightened Mineralogists: Mining Knowledge in Colonial Brazil, 1750-1825" in *Osiris* 15:00 (2001): 174-189, 178.

[27] Jean-Baptiste Tavernier, *Les six voyages de Jean-Baptiste Tavernier...qui'il a fait en Turquie, en Perse, et aux Indes* (Paris: G. Clouzier et C. Barbin, 1676). The Bleu de Tavernier is now more famously known as the Hope Diamond, located in the

Smithsonian Natural History Museum. See François Farges and Thierry Piantanida, *Le diamant bleu* (Paris: Michel Lafon, 2010).

[28] Muséum national d'histoire naturelle (MNHN) collections, Paris, Bleu de Tavernier, MNHN-NC; Diamant brut *jonquille* of 22.25 carats, MNHN No. 88.78; and diamond MNHN No. 82.141.

[29] Alfred A. Levinson, "Diamond Sources and Their Discovery" in George E. Hamilton, ed., *The Nature of Diamonds* (Cambridge: Cambridge University Press, 1998): 73. Gem collector Henry Hope (1735-1811) counted on Catherine the Great as a client and in exchange for loans to the King of Portugal, had a concession to sell Brazilian diamonds in Amsterdam.

[30] Ibid., 76.

[31] Silvia Figueirôa and Clarete da Silva, "Enlightened Mineralogists: Mining Knowledge in Colonial Brazil, 1750-1825" in *Osiris* 15:00 (2001): 174-189, 178.

[32] *Actes de la Société d'histoire naturelle de Paris* (Paris: Reynier, Prevost, et Amand-Koenig, 1792), see "Diamans du Bresil" by M. d'Andrada: 78-80.

[33] ARTFL Encyclopédie Project, Robert Morrissey, general editor: 11:626, accessed on November 1, 2009, http://artfl.uchicago.edu. Refer also to Liliane Hiliare Pérez, "Invention, culture technique et entreprise entre France et Angleterre au XVIIIe siècle," mémoire d'habilitation à diriger des recherches, Université de Paris-1, 2008.

[34] Diderot, *Encyclopédie*, 2:420.

[35] D'Alembert and Diderot, *Encyclopédie*, « L'atelier du tailler de diamants et de pierres précieuses »: 2:420, 2:452.

Written by Jaucourt, the dictionary entry listed for *pierre gravée* stated "Le diamant, la seule pierre précieuse sur laquelle on n'avoit pas encore essayé de graver, l'a été dans ces derniers siècles. Il est vrai que M. André Cornaro, venitien, annonça en 1723 une tête de Néron gravée en creux sur un diamant, & pour relever le prix de cette gravure qu'il estimoit douze mille sequins, il assûroir qu'elle étoit antique. Mais on ne peut guere douter du contraire, & peut-être son diamant étoit un ouvrage de Constanzi qui a long-tems travaillé à Rome avec distinction... » (12:588). See the entry under precious stones written by Baron d'Holbach (12:594).

[36] DiamantMuseum, Bruges, Belgium, diamond polishing workshop demonstration and exhibition panels, visit by author during February 2009. See also François Houssard, "Lapidaire et diamantaire: l'art de la taille des pierres précieuses," in *L'Estampille*, no. 99, July 1978, 54-62.

Diamond cuts have their own particular history. For example, the rose cut or "Antwerp rose" from the 1500s had a single hemisphere of twenty-four facets or two

back-to-back hemispheres of forty-eight carats. The *briolette* was a form for use in a pendant or as a dangling bauble in a crown, shaped as a double Dutch rose cut with one of the hemispheres being elongated. Older forms included the rounded French *cabochons* that became popular in the seventeenth century. Continuing into the 1700s, the old mine cut, or the earliest version of the brilliant cut called the "cushion cut," employed a girdle shape, square in form with gently rounded corners and brilliant style facets, where the crown was tall with a smaller table for the stone. Double cut brilliants were often called *mazarins*, or *Peruzzi cuts*, where the main body of the stone was shaped by cushion cuts rather than by circular cuts. Since bruting had not yet been invented, the diamond typically possessed a square or rectangular geometry with rounded corners. The old European cut in the 1800s was the forerunner of the modern round brilliant cut, with a very small table, a heavy crown for the stone, and a very tall overall depth with a circular girdle.

[37] D'Alembert and Diderot, 2:282. Romé de l'Isle described the art of shaping the diamond by first beginning with its interior qualities, rather than its external characteristics, "The art of cutting or splitting the Diamond in a certain sense, sufficient to demonstrate that this Stone is composed of small extremely thin layers," he remarked, was "so closely joined one to another, that the Stone would not allow it to be smooth and brilliant in the place of fracture" from *Essai de cristallographie* (1772).

[38] *Lettres édifiantes et curieuses des Jésuites de Chine: 1702–76*, presented by Isabelle et Jean-Louis Vissière (Paris: Desjonquères, 2002). François-Xavier d'Entrecolles' letters were written in 1712 and 1722. According to some sources on porcelain manufacturing, he mixed up the terms for kaolin and petuntse.

[39] Diderot, *Encyclopédie*, 4:940.

[40] David Jeffries, *A treatise on diamonds and pearls in which their importance is considered: and plain rules are exhibited for ascertaining the value of both: and the true method of manufacturing diamonds* (London: C and J. Ackers, 1751): 9-15. Louis Dutens, in *Des pierres précieuses* (1776), republished Jeffries' table of diamond evaluation that provided equivalent values in louis for a precious stone based on its number of carats. Cited from the translated French version of Jeffries' text published by de Bure & Tilliard libraries (1753).

[41] Pierre–Jean Mariette, *Traité des pierres gravés* (Paris: 1750): 207-208. See sections "Explication de la Planche représentant le Graveur en Pierres fines au travail, et les divers instrumens dont il se sert" and "Representation de la situation dans la quelle est le Graveur en pierres fines, lorsqu'il opere, et des divers instrumens qu'il employe."

[42] Ivan Gaskell, "Tradesmen as Scholars: Interdependencies in the study and exchange of art" in *Art History and Its Institutions: Foundations of a Discipline*, edited by Elizabeth Mansfield (New York: Routledge, 2002): 148-149. Consult Georges Duplessis, *Catalogue de la collection de pièces sur les beaux-arts, imprimées et*

*manuscrites: recueillie par Pierre-Jean Mariette, Charles-Nicolas Cochin et M. Deloynes, et acquise récemment* par le Département des estampes de la Bibliothèque nationale (Paris: A. Picard, 1881) and Kristel Smentek's dissertation from University of Delaware entitled "Art, Commerce, and Scholarship in the Age of Enlightenment: Pierre-Jean Mariette and the Making of Art History" (2008).

[43] Mariette, 93-94.

[44] Ibid., 97. Sales and collection catalogues as pervasive archival documents provide detailed lists of minerals, shells, coins, and other curiosities yet lack any critical notes about individual attitudes towards the design of a particular piece or the acquisition of such works. For instance, refer to Edme François Gersaint, *Catalogue raisonné des tableaux, diamans, bagues de toute espèce, bijoux autres effets provenant de la succession de feu M. Charles Godefroy* (Paris : Pierre Prault, Jacques Barrios, 1748) : plates 44-45, Diamans et Bijoux.

[45] Johnson, "Stained Glass and Imitation Gems," 224. See René Héron de Villefosse, *Pierres précieuses de Paris: demeures historiques* (Paris: Commissariat général au tourisme, comité du tourisme de Paris, 1945).

[46] Neil Kamil, *Fortress of the Soul: Violence, Metaphysics, and Material Life in the Huguenots' New World, 1517-1751* (Baltimore: Johns Hopkins University, 2005): 3, 309.

[47] Ibid., 311. On subterranean matter dug up from the Saintonge desert, Palissy wrote, "sometimes I searched for pebbles to make enamel glazes and artificial stones: now then, after having assembled a great number of pebbles and wanting to pound them up, I would find many that were hollow inside; there were certain points like those of a diamond, glistening, transparent, and very beautiful" (313).

[48] Alfred Gell, "The Technology of Enchantment and the Enchantment of Technology" in *Anthropology, Art, and Aesthetics*, eds. Jeremy Coote and Anthony Shelton (Oxford: Clarendon Press, 1992): 44, 59, 40-63.

[49] Sarah Lowengard, *The Creation of Color in Eighteenth-Century Europe* (New York: 2006), Gutenberg-e Book, www.gutenberg-e.org/lowengard, and Manlio Brusatin, *Histoire des Couleurs*, préface de Louis Marin, translated from Italian (Paris: Flammarion, 1986). Manufacturers, merchants, and inventors, Lowengard states, discovered colormaking techniques in the studio and the workshop.

[50] Johnson, 222. From a contemporary viewpoint, Jean Escard discusses how artificial rubies of nineteenth-century provenance were created by the synthetic processes of Gaudin and Verneuil. Small particles of authentic rubies were reduced to a powder and fused with chemicals at a high temperature to produce a stone similar to a true ruby,

except for noticeable striations and bubbles that could be revealed under the guise of a microscope (221).

[51] Jean-Henri Prosper Pouget, *Traité des pierres précieuses – Recueil de parures de joaillerie* (Paris: 1908), Bibliothèque Nationale de France, Paris.

[52] Marcia Pointon, *Brilliant Effects: A Cultural History of Gem Stones and Jewellery* (New Haven: Yale University Press, 2010): 2-3 in chapter 1, Fault Lines and Points of Light.

See also René Héron de Villefosse, *Pierres précieuses de Paris: demeures historiques* (Paris: Commissariat général au tourisme: comité du tourisme de Paris, 1945).

[53] Ibid., 3-4. Though it is not clear throughout the course of the book if her arguments are consistently supported, Pointon attempts to address minor details in the histories of luxury and goods that were not frivolous manifestations but indicated greater cultural transgressions enacted by jewelry to "undermine discursive formations and disrupt economies of meaning."

[54] Marcia Pointon, "Surrounded by Brilliants': Miniature Portraits in Eighteenth-Century England" in *The Art Bulletin*, Vol. 83, No. 1 (Mar. 2001): 48-71, 49, 57. See Françoise Houssard, *Lapidaire et diamantaire: l'art de la taille des pierres précieuses* (1978).

Snuffboxes and other works of art fabricated from silver often sported diamond-encrusted surfaces. See C. Louise Avery, "French Snuffboxes: A Notable Loan," in *Bulletin of the Metropolitan Museum of Art*, Vol. 30, No. 12 (Dec. 1935): 245-248; Henry Nocq, *Le Poinçon de Paris: Répertoire des maîtres-orfèvres de la jurisdiction de Paris depuis le moyen-âge jusqu'à la fin du XVIIIe siècle*, 5 vol. (Paris: 1926-1931).

[55] Georg Simmel, *On Individuality and Social Forms*, edited by Donald N. Levine (Chicago: University of Chicago Press, 1971).

[56] Katie Scott, "Hierarchy, Liberty, and Order: Languages of Art and Institutional Conflict in Paris (1766-1776)" in *Oxford Art Journal*, Vol. 12, No. 2 (1989): 59-70, 59. Akin to the discourse on the status of artisans, jewelry's significance as an art object is also often under close scrutiny.

[57] Katie Scott and Deborah Cherry, eds., *Between Luxury and the Everyday Decorative Arts in Eighteenth Century France* (Malden, MA: Blackwell, 2005): 1. Refer to Christopher Reed, *Not at Home: The Suppression of Domesticity in Modern Art and Architecture* (London: Thames and Hudson, 1996).

[58] Anonymous, three-sided seal, M.59-1962, made in France, date unknown, painted scenes by François Delapierre, Victoria & Albert Museum, Metalwork collection,

London. The poinçon associated with Delapierre is a crowned fleur de lys, two grains, and one star, with the letters FDLP.

[59] Valmont de Bomarre had studied chemistry, pharmacy, and surgery, aided by naturalists such as Buffon, Réaumur, Rouelle, D'Holbach, D'Alembert and Diderot during his career. He had visited principal cabinets of curiosity, metal workshops, mining sites, and excavation areas in order to assemble his course on natural history, commissioned by the Marquis d'Argenson the Minister of War. Returning to Paris in 1756, he later became a member of the Société Royale d'Agriculture in 1767 and two years later, was chosen to direct the Cabinet de physique et d'histoire naturelle of the Prince of Condé at Chantilly; his treatises *Minéralogie, ou Nouvelle exposition du règne minéral* (1762) and *Catalogue d'un cabinet d'histoire naturelle* (1764) were well-received by his peers.

[60] Louis Dutens, *Des pierres précieuses et des pierres fines, avec les moyens de les connaître et de les évaluer* (Paris: F.A. Didot, 1776): 13.

[61] Finlay, *Jewels: A Secret History*, 334. It was unlikely that Hindu deity statues were historically decorated with large gems.

[62] Dutens, *Pierres précieuses*, 13-15. Romé de l'Isle, who had written a treatise called *Des caractères extérieurs des minéraux, ou Réponse à cette question: Existe-t'il dans les substances du règne mineral des caractères qu'on puisse regarder comme spécifiques (I); & au cas qu'il en existe, quells sont ces caractères?* (1784), expounded upon the physical qualities that endowed precious stones and minerals with each of their chemical behaviors, in particular, characteristics such as size, mobility, impenetrability, and absolute gravity. The primitive properties of a mineral, specific to physics, were often related to the "outward form" of the specimen, such as weight, measure of hardness, transparency or opacity, flavor, odor, and color.

[63] Pierre Elisabeth de Fontanieu, *L'Art de faire les cristaux colorés imitans les pierres précieuses* (Paris: Impr. de Monsieur, 1778), Bibliothèque Nationale de France, Paris. Refer also to Franz Carl Achard, *Analyse de quelques pierres précieuses, ouvrage traduit de l'allemand avec des remarques, par M. J. B. Dubois* (1783). Achard articulated his fascination with the temperament of precious stones, stating that exterior properties were still considered pivotal in disclosing the behavioral possibilities of their interior composition. If "the exterior of the body is not enough for us to learn their properties, their effects, and their origin" he implied, "we can only acquire this knowledge by that of nature and the proportion of their constituent parts, and consequently by the chemistry-based physics." Achard's description of the garnet of Bohemia as a transparent, red, and crystallized stone emphasized its properties of electricity through friction.

[64] Mary Elvira Weeks, *Discovery of the Elements* (Easton, PA: Journal of Chemical Education, 1933): 154-155. Refer to Fourcroy and Vauquelin, *Éncyclopédie*

*méthodique: chimie et métallurgie*, sixth volume (1815) and "Expériences sur le Daphne alpina" in *Annales du Muséum d'histoire naturelle* (1812), XIX, p.177-187.

[65] Ibid., 166-167. For a more predictable interpretation on the discursive meanings of jewelry, see Susan Wager's dissertation in progress at Columbia University entitled "Madame de Pompadour's Indiscreet Jewels: Reproduction, Luxury Consumption, and the Construction of Self in Eighteenth-Century France."

[66] Bibliothèque des Arts Décoratifs, Paris, Pierre-Philippe Choffard inv. et Louis-Marin Bonnet, *Cahier de motifs de rocaille et de fleurs* (Paris: La Veuve de F. Chereau, 1760). See Marianne Roland-Michel, *Lajoue et l'art rocaille*, (Neuilly-sur-Seine, 1984), Guilhem Sadde, "Jean-Calude Duplessis: La liberté du style rocaille" in *Estampille, L'Objet de l'Art*, no. 392 (2004): 42-51, Mary L. Myers, *French Architectural and Ornament Drawings of the Eighteenth Century* (New York: 1991).

[67] Objects 19736 and 4194 A, Musée des Arts Décoratifs, Galerie de Bijoux, Paris. Consult Diana Scarisbrick, "The Diamond Ring and Marriage Ring," in Harlow, *The Nature of Diamonds* (Cambridge: Cambridge University Press, 1998): 163, and Scarisbrick, *Rings: Symbols of Wealth, Power, and Affection* (London: Thames and Hudson, 1993).

[68] Anonymous, ring, M.215-1962, France, 1775-1825, Victoria & Albert Museum, Metalwork collection, London. With the assistance of Richard Edgcumbe, senior curator of the V&A Metalwork collections, I examined this ring firsthand and noticed that the sheer refraction of brilliant diamonds, each with thirty-two facets, is visually palpable when compared with a viewing of a paste diamond brooch. In comparison, the Pouget brooch, for example, only possessed eight to twelve facets on each false stone that were slightly irregular in shape.

[69] Anonymous, dove brooch, M.56-1962, France, 1755, Victoria & Albert Museum, London. The brooch is likely of French origins but possesses a fissure on the back of the piece, which indicates that it may have been repaired at some unknown point in time. The pin attached was also added at a much later date.

[70] Anonymous, bracelet clasps, M.51&A-1962, made in France, 1770, Victoria & Albert Museum, Metalwork collections, London.

[71] M.D.S. Lewis, *Antique Paste Jewellery* (London: Faber and Faber, 1970).

[72] Joan Evans, *A History of Jewellry, 1100-1870* (Dover, 1989): 151. See "Les pierres de Strass et leur inventeur," *Cahiers de la céramique du verre et des arts du feu*, no. 23, 1961, Société des amis du Musée Nationale de Céramique, Sèvres (Seine et Oise): 36.

[73] Hélène Metzger, *La genèse de la science des cristaux* (Paris: A. Blanchard, 1969): 68-69. Refer also to Metzger, *Les doctrines chimiques en France du début du XVIIe siècle à la fin du XVIIIe siècle* (Paris : A. Blanchard, 1969) and *La méthode philosophique en histoire des sciences: textes 1914-1939* (Paris: Fayard, 1987).

[74] The manuscripts of R.J. Haüy are conserved at the Bibliothèque centrale du Muséum national d'histoire naturelle, Paris, and "René-Just Haüy (1743-1822), physicien," in *Revue d'histoire des sciences*, Tome 50-3 (Juillet-Septembre 1997): Vendôme: Presses Universitaires de France provides some basic biographical information.

[75] Jean-Louis Baptiste Romé de l'Isle, *Essai de cristallographie, ou description des figures géométriques* (Paris: 1772): 110. Refer to Antoine Joseph Dezallier d'Argenville (1680-1765), *L'Histoire naturelle éclaircie dans une de ses parties principales, l'oryctologie, qui traite des terres, des pierres, des mét* (Paris: De Bure, no date) See Plate: Matrices des Pierres Fines (152-153) and Plate: Cristaux (164-165) ; Plate: Proportion du Diamant (175).

[76] Ibid., 195. Refer to Jean-Louis Baptiste Romé de l'Isle, *L'action de feu central démontrée nulle à la surface du globe* (Paris: Fr. Didot, 1781).

[77] Ibid., 196. Louis-Jean Marie Daubenton, *Tableau méthodique des minéraux, suivant leurs différentes natures, et avec des caractères distinctifs, apparens ou faciles à reconnoître* (Paris: 1795).

[78] Ibid., 111. Jean-Baptiste Tavernier, *Les six voyages de M. Tavernier*, tome 4 (Paris: 1713): 203, 207-208. See illustrated plates "Pierres précieuses, diamants et rubis d'Europe et d'Asie" (59) and "Vingt des plus beaux diamants rapportés d'Inde" (61).

[79] Ibid., 198-199. *Catalogue systématique et raisonné des curiosités de la nature et de l'art qui composent le cabinet de M. Davila, avec figures en taille douce, de plusieurs morceaux qui n'avoient point encore été gravés*, Tome 1 (Paris: Briasson, 1767).

[80] M. Geoffroi, *Mémoires de l'Académie Revue des Sciences* (1716): 9.

[81] Romé de l'Isle, *Essai de cristallographie*, 209. Refer to Bleu de Tavernier, MNHN-NC; diamant brut "jonquille" of 22.25 carats, MNHN No. 88.78, diamond MNHN No. 82.141, specimens in the Muséum national d'histoire naturelle (MNHN), Mineralogy department, Paris. Some of the museum's minerals held in storage were originally part of Romé de l'Isle's own mineralogical collection. I thank François Farges, head of Mineralogy, for providing explanations for many of these acquisitions. On the vitreous electric property (through friction) of diamond surfaces, see René-Just Haüy, *Traité de Minéralogie*, (Paris: Louis, An X, 1801): 304, fig.10, plate LXII.

[82] Jean-Louis Baptiste Romé de l'Isle, *Des caractères extérieurs des minéraux, ou Réponse à cette question: Existe-t'il dans les substances du règne mineral des caractères qu'on puisse regarder comme spécifiques (I); & au cas qu'il en existe, quells sont ces caractères*?, preface, xiv-xv. For later works by René-Just Haüy, see *Tableau comparatif des résultats de la cristallographie et de l'analyse chimique relativement à la classification des minéraux* (1809) and *Traite des caractères physiques des pierres précieuses* (Paris: Courcier, 1817).

[83] Romé de l'Isle, *Des caractères extérieurs des mineraux*, 4.

[84] George E. Harlow, ed., *The Nature of Diamonds*, (Cambridge: Cambridge University Press with the American Museum of Natural History, 1998): 11. Friedrich Mohs developed a relative scale for the variable quotient of hardness in minerals in 1822, where higher ranked minerals were able to scratch the surfaces of the lower-ranked ones. Talc was the softest, along with gypsum, calcite, and fluorite, with topaz, corundum, and diamond as the hardest materials.

[85] Guillaume-François Rouelle published a series of chemical experiments as brief extractions from *Journal de médecine, chirurgie, pharmacie* including "Analyse du Petit-Lait préparé sans Creme de Tartre" (p.3-18); "Sur les Fécules ou parties vertes des Plantes, & sur la matiere glutineuse ou végeto animale" (Paris: Imprimerie de Vincent, Juillet 1773), 3-11; "Expériences et observations sur le sel qu'on trouve dans le Sang de l'Homme & des Animaux, ainsi que dans l'eau des Hydropiques"(Paris: Imprimerie de Vincent, Juillet 1773), 12-20; *Expériences faites par MM. Rouelle et d'Arcet, d'après celles de M. Sage sur la quantité d'or qu'on retire de la terre végétale, et des cendres des végétaux* (no date).

For broad historical accounts of the diamond's composition, see Louis Dieulafait (1830 - ?), *Diamants et pierres précieuses*, 3e édition (Paris: Hachette, 1887).

[86] René-Just Haüy, *Traité de Minéralogie*, (Paris: Louis, An X, 1801): 301-2. "However, the highly refractive power of the diamond placed among smooth and sulfurous bodies (I) and in the table on which Newton had presented the series of relationships between the refractive powers and densities, the diamond found in continuation of turpentine and oil of amber. Newton had concluded from this result that the diamond was probably an unctuous coagulated substance, an expression which, in the sense that he himself attached to it, was synonymous with inflammable ... As Newton had almost read the results of the refraction that the diamond was a combustible body, and that water should contain an inflammable principle. In outlining these insights, it is expressed in the language of chemistry of his time, and it is one more reason to admire how his genius placed in this great distance, was addressed so closely, and by a road apparently so diverted, the results to which modern chemistry owes some of its glory."

[87] *Experiences sur le diamant par MM. Macquer, Cadet, et Lavoisier...et par M. Mitrouart* (no date). Other works by Macquer le Blanc include *Élémens de chymie théorique* (Paris: J.T. Hérissant, 1749); *Plan d'un cours de chimie éxperimentale et*

*raisonée* (Paris: J.T. Hérissant, 1757); *Art de la teinture en soie* (Paris: Desaint, 1763), Bibliothèque Nationale de France, Paris.

[88] Some online biographical information on Jean d'Arcet has been compiled by Jaime Wisniak, formerly of Purdue University, *Revista CENIC Ciencias Químicas*, Vol. 35, No. 2, 2004: 108-109.

[89] Louis Dutens recorded his observations on diamonds in *Des pierres précieuses et des pierres fines, avec les moyens de les connaître et de les évaluer* (Paris: F.A. Didot, 1776) : 121. He had published a number of works dating from 1766 to 1806, including among them: from the Bibliothèque Nationale de France, Paris, *Recherches sur l'origine des d'couvertes attribuées aux modernes: où l'on démontre que nos plus célèbres philosophes ont puisé la plupart de leurs connaissances dans les ouvrages des anciens et que plusieurs vérités importantes sur la religion ont été connues des sages du paganism* (1766); a translation of the complete works of Leibniz in six volumes, *Gothofridi Guillemi Leibntii opera omnia* (1768); *Lettres sur un automate, qui joue aux échecs, premiére lettre* (1770); *Explication de quelques médailles de peuples, de villes, et de rois grecques et phéniciennes* (1773); *Explication de quelques médailles phéniciennes du cabinet de M. Duane* (1774); *Du miroir ardent d'Archimede* (1775); *Itinéraire des routes les plus fréquentées, ou Journal d'un voyage aux villes principales de l'Europe depuis 1768 jusqu'en 1783* (1784); *Court examen de l'état politique de la Grande-Bretagne au commencement de l'année 1787*, translation of *A Short History of the Political State of Great Britain* by N.W. Wraxall (1787); *Mémoires d'un voyageur qui se repose; contenant des anecdotes historiques, politiques et littéraires, relatives à plusieurs des principaux personnages du siècle*, 3 volumes (1806); *L'ami des étrangers qui voyagent en Angleterre* (London : P. Elmsley, 1787) ; *Correspondance interceptée [between the Chevalier de B** and the Marquis de L**]* (Paris : 1789).

[90] For an approximate modern conversion from grains to carats, 1 carat equals 1/5 of a gram or about 200 milligrams. 1 grain equals 1/7000 lb. or about 64.7999 milligrams. On the other hand, 1 grain equals .3239945 carats, and 1 carat equals 3.0864716 grains.

[91] Dutens, *Des pierres précieuses*, 121.

[92] Ibid.,123. "The color of the diamond varies infinitely; one can recount not only all of colors but all of the nuances of all of the colors," Romé de l'Isle stated, "one sees the color of rose as in the ruby, some orange as in hyacinth, some of a beautiful yellow like Topaz, green like Emerald, blue like Sapphire; reddish and dark ones are not common. The Ancients spoke of a bluish Diamond or the color of steel, called Syderites because of this color."

[93] Rhoda Rappaport, "Lavoisier's Geologic Activities, 1763-1792" in *Isis*, Vol. 58, No. 3 (Autumn 1967): 375-384; Rappaport, "The Early Disputes between Lavoisier and Monnet, 1777-1781" in *British Journal for the History of Science*, Vol. 4, No. 3

(June 1969): 233-244; Rappaport, "Lavoisier's Theory of the Earth" in *British Journal for the History of Science*, Vol. 6, No. 3 (June 1973): 247-260.

[94] Charles Gillispie, *Science and Polity in France*: *Revolutionary and Napoleonic Years* (Princeton: Princeton University Press, 2004): 25.

[95] Antoine-Laurent Lavoisier, *Sur la destruction du diamant par le feu* (1772): fifth experience, 38-88. Englishman Smithson Tennant (1761-1815), "On the nature of the diamond," in *Philosophical Transactions of the Royal Society* (1797): 87, 97. He substantiated that the diamond was nearly pure carbon in composition and differed from charcoal in its external form. For more information from a contemporary perspective, see Robert Hazen, *The Diamond Makers* (Cambridge: Cambridge University Press, 1999).

## CHAPTER 2

### On Metal: Revolutionary States of Exchange between Decorative Ornament and Monetary Currency

La numismatique est la physique de l'histoire.

- Aubin-Louis Millin, 22 August 1795

Perched upon the banks of the Seine, the Hôtel des Monnaies, whose lineage dated back to the era of Charles the Bald, proudly presided over ten artisanal workshops, spread throughout Rouen, Reims, and Sens, France. Louis XV (1710-1774) had, in fact, relocated the mint to its present site on the Left Bank in the Hôtel de Conti, a palace designed by architect Jacques Antoine-Denis in 1775. The mint's duties balanced precise production with bureacratic compliance. Six statues on the building's neoclassical front façade personified the longstanding virtues of prudence, abundance, fortitude, justice, peace, and commerce. These guiding principles of national sentiment became subsumed into the monetary currency and commemorative pieces distributed by the mint. **(Fig. 2.1)** *Auro argento aeri flando feriundo*, a phrase borrowed from the honorable adage of Roman mint magistrates, could be translated roughly into "one of three men for the striking and casting of gold, silver, and bronze." Boldly lettered across the top of an engraved depiction of the Hôtel des Monnaies, this aphorism implied that these three metals had a significant role in shaping the fiscal rise and decline of many European nations.

Louis XV, spurred by the lingering effects of the Edict of Nantes and the surmounting costs incurred by the ongoing Seven Years' War (1756-1763), ordered a mandatory liquidation of metalwork, including aristocratic patrons' personal accessories,

regional French churches' monstrances and crucifixes, and royal jewelry. Any materials containing silver or gold — serving platters, cutlery, snuff boxes, and tapestries holding metallic threads —were consigned directly to the Hôtel des Monnaies in Paris or other designated provincial locations, leaving exiguous examples intact for future generations. The disappearance of precious metals over many centuries heralded a tremendous deficit of historical workmanship but more clearly, it portended how economic concerns, more or less, took precedence over conserving artistic heritage. This ostensible loss of metallic resources during the late eighteenth century signaled the persistent troubles of the French economy, rampant financial speculation, and the subsequent demise of paper currency. What is striking about this specific historical moment relates to the convergence of these factors, and in particular, how fiscal inflation and public doubt briefly usurped silver and gold's assumed value. In all of this, these collective factors formidably anticipated the gradual waning of France's dominance as a sovereign authority in Europe and its colonial expanses.[1]

The continued abolition of precious metals is an intriguing premise that delves into the historization of natural resources, economic attitudes, and human values. Upon closer inspection, these repeated events of melting down metals beg for more scrutiny, in terms of the use of metals as initially envisioned by the monarchy and their relationship to the contingent prosperity of the French state.[2] What I call "substance economy" defines how the properties of silver and gold translated their physical attributes into economic associations during the creation of monetary currency, echoing societal reforms that swept through the revolutionary years of 1789-1799 and into Napoleon I's reign. Royal legislation helped to define how precious metals became emblematic of the state's

jurisdiction, fixing acceptable ratios for metallic quantities and guidelines for coin manufacturing. In turn, currency consequently swayed public perceptions of the French monarchy and its successive governmental regimes. Substance economy refers not only to material conversions but also to the political fluctuations that motivated the artistic designs of decorative ornament and fiscal currency as visual modes of representation. Precious metals operated as historical signifiers that mediated between value, belief systems, and sovereign instrumentalization.

Ornament and currency, it could be argued, embodied two distinct systems of regulation employing human value as their basis – one symbolizing insouciant luxury and status and the other born from pragmatic necessity. In moving away from any claims to natural origins, these two modes of artistic production based upon silver and gold relied upon social constructions of their perceived value to underscore the meaning of metals through aesthetic and economic expressions. For instance, ornament regulated standards of luxury while currency was produced on the basis of supply and demand. The telluric origins of silver and gold were interred within the aesthetic bodies of decorative ornament, as objects of artifice with secondhand ancestries. Both types of decorative art functioned as regulators of economy. These new incarnations of metal, in fact, obliterated any vestiges of fundamental natural worth; they became solely appraised and defined in terms of human categories such as rococo or neoclassical styles, commemorative imagery, royal portraiture, or more candidly, numeric francs or décimes. Natural attributes of gold and silver were no longer primary considerations and were replaced with visual signs of sensuous decoration, which gradually transitioned into sobering symbols of liberty, marking the years between Louis XV's reign and the French

Revolution. In examining a range of ornamental and fiscal objects, this chapter posits that these two modes of artistic production were dependent upon tangibility and qualities of material facture. Luxury, which was coerced into an instrument of necessity, was impelled into the service of a republican agenda that reclaimed the nation's natural resources for its citizens.

Art's tangibility in decorative items addresses the elaborate interplay between the dynamic processes of creative acts, their emergent social conditions, and their translation into visual forms. Decorative ornament yielded from the same destructive forces that desecrated architectural monuments transmitted their previous experiences into an unforeseeable multitude of coins and medals, or forms of "radically active matter with its own determination for reassembly."[3] Such an aesthetic charging of an object across broad expanses of time summoned forth a reanimated vitality to the materials that once dwelled in serving dishes, cutlery, candelabra, or gilded hardware on a dresser or side table. Coin fabrication was endowed with an increased experiential historicity through its prior states of exchange infused by the hands of artisans, engravers, and silversmiths.[4] The tangible attributes of metal — density, luster, malleability, and weight — allowed goldsmiths and engravers to experiment with techniques of chemistry, engineering, and metallurgy. These techniques changed how decorative ornament, coins, and medals became conceptualized and therefore, manufactured.

Spatial and temporal displacements affecting metal conveyed a non-linear, dialectical engagement with history between the substance of a material, its fusible state of transition, and its eventual stabilized form as a work of art. Authors, spectators, and users, suggested by Dario Gamboni, all imbued silver and gold with their own values and

sensibilities that cyclically gained heterogeneous connotations across different temporal contexts. However generalized Gamboni's claim may seem, it commences a fruitful discussion about the united historicity of two differing modes of artistic production — decorative ornament and its later embodiment as monetary currency — both of which represented art's influence at the limited scale of the modest object.

Moving away from the acts of imitation featured in the first chapter towards exploits of mass accumulation and transformation, this second chapter surveys these catalytic transformations of metal, from its base condition to ensuing reconstitution within designed objects. Imitation as a complex phenomenon produces expressions that incite style and substance as well as evoke delight and disgust. Here, the material facture of ornament and currency referred not to the replication of natural forms but to the artful processes that exploited metal's property of malleability. The first part contemplates how silver was formed and manifested in decorative ornament designed by Thomas Germain, his son François-Thomas Germain, and Jacques Röettiers. French artisans, engravers, and silversmiths during the latter half of the eighteenth century promoted designs that reinvented the central expression of ornamental function but also created germane visual subjects bestowed with political relevance. The second part addresses the pervasive forfeiture and ensuing reconstitution of precious metals taken from ornamental objects and the legislative regulations that sought to control the economic value of these natural resources. The palpable attributes of precious metals triggered repressed anxieties about the economic value of France's raw materials and in turn, its greater political outreach as a nation. Emphasizing the medal as a collectible article, the third part analyzes the portrait profiles on commemorative pieces created by Pierre-Simon Benjamin Duvivier

and Auguste Dupré during the revolutionary years, concluding with a succinct deliberation about currency, its mediated value, and its contested relationship to the discipline of history.

**Silversmiths' *choix piquante***

French silversmiths were responsible for shaping liquid metal into decorative ornament during a period when the rococo and neoclassical styles co-existed alongside each other. The rococo brought to mind visually tempting images of crustacean creatures, fish, shells, and the undulating profiles of ocean waves. Hunting and fishing motifs punctuated with sprinting dogs, brass bugles, and crouching stags were as prevalent as eccentric chimeric beasts and grotesque masks of folly. Critic Charles-Nicolas Cochin begged artisans not to create "a hare as big as a finger beside a full-scale artichoke and children the same size as a vine leaf," inveighing against these imprudent inventions that surpassed rational thought.[5] In acknowledging Cochin's adamant denigration of the rococo, we are more concerned with the subjects and techniques of silversmiths who used this embellished style as an apt opportunity to test what Marian Hobson has called *choix piquante*. She purports that aesthetic tensions were generated between a material and the usage to which it was put. Many of the rococo's sculptural forms, cast into silver, were not regarded as pragmatic for the specific material being manipulated. Segregated and displaced components such as horse hooves, lion heads, dragon tails, and fish scales, for example, confused the fundamental relationship existing between a surface and its structure by unforeseen deviations in scale or proportion.

Rococo ornament habitually defied conventional techniques, employing "trivial forms that refuted any sense of profundity."[6] Katie Scott has noted that its properties of "disproportion, exaggeration, imagination, and instability" were consistently held as essential and not relational characteristics. "Small was beautiful" for many detractors, placing larger-scale enterprises of historical proportions out of reach.[7] However, the rococo style, which is often recognized for its decorative arts and interiors, has been influential at the scale of the modest object. Scholars such as Peter Fuhring have studied the works of Thomas Germain that were featured in François Desportes's *Silver Tureen with Peaches* (1739), but, less is known about his working methods and more importantly, the connection to material practices and their emulation of nature.[8] As we will see, the tensions between a material, its function, and its ornament stemmed from the supposed disharmony between an object's design components.

Immortalized by Voltaire in his poem "Les Vous et les Tu," silversmith Thomas Germain (1673-1748) openly embraced the rococo's *esprit de vivre*, owing many of his designs to the innovations of his predecessor Juste-Aurèle Meissonnier.[9] Meissonnier, who created many influential models for decorative objects such as tureens, pioneered substantial silversmithing techniques involved with lost wax and life-casting. With the acknowledged reception of his methods, Meissonnier serves as a chief predecessor to Germain, who further refined and evaluated many of these inherited techniques in light of more sophisticated advancements in metallurgy and manufacturing production. Having practiced as an architect, Germain fabricated many unique pieces for the French monarchy known only through drawings and entries in royal inventories that describe their ornamentation in detail, including their elements of asymmetry, naturalistic flowers,

spiral movement, and broken scrolls.[10] Germain's designs, like many of his contemporaries, blended rococo elements with those of the emergent neoclassical style. For example, a pair of 18.5 inch girandoles with sunflower branches, created by Germain in 1748, appeared in the *Journal de Garde-Meuble*; the decorative objects themselves have long since disappeared, but their extensive literary account endures:

> The stem formed of an unwinding plant is accompanied and decorated by seeds, flowers, leaves and branches in relief, after nature, and after four cupids of different postures. – The two on the bottom settle and support a laurel wreath; those above give a hand, one holds a branch, the other contains a sunflower, which terminates the girandole. – There are mobile sunflower seeds, which fall on the bathers and make room for the sconces that receive the candles.[11]

Germain's shaped organic vegetables and animals exercised a meaningful influence upon many of his European contemporaries including the Viennese silversmith Ignaz Joseph Würth (1742-1792). **(Fig. 2.2)** In a table centerpiece initially produced for tax farmer Samuel-Jacques Bernard, two frolicsome cherubs recline atop a scalloped shell, with flowing grape vines that cascade towards a fluted base, becoming candlestick holders. The congregated cacophony of conjoined angels and figures of the hunt, including resting greyhounds, horns, and foliage, resemble the characteristics of the rococo style. Some of the visual motifs adorning the Grecian urn at the center of the piece, however, are far more neoclassical in character – that of striped banding, delicate beading, and a centered frieze of human figures gesturing – indicating a unresolved confluence of hybridized methods. In both cases, the intricate branches of sunflowers or the huddled grouping of greyhounds and hunting horns do not bear any rational relationship to their posts or centerpiece base. They perform as ornate instances of the artisan's imagination.

The French rococo's influence extended immediately to nearby England, summoning related forms perceived in Germain's works. London goldsmith Paul de Lamerie, for instance, reinterpreted many of Meissonnier's designs of putti children wearing pith helmets formed as shells and clutching bunches of ripe grapes. Grotesque motifs in de Lamerie's objects were also copied in Paul Crespin's satyr handles spiraled onto the silver-gilt wine coolers made for the Duke of Marlborough (1733) and the Duke of Devonshire's inkstand (1739) composed of credible shells utilized to hold ink and pounce. Nicholas Sprimont's silver salt shakers appeared with a sculpted crayfish alighted on stark rocks, whose modeling was of a high level of expertise; these salts along with ones featuring crabs were part of a marine-themed dinner service that had once belonged to Frederick the Prince of Wales.[12] With the gradual infiltration of Greco-Roman motifs, an elevated yet moralistic decorative style in later years did little to dampen the aesthetic quality of workmanship on view in princely pleasure houses or private residences.[13]

The anonymous entry from the *Encyclopédie* tells us that the French corporation of silversmiths dated back to 1260, and its members were limited to no more than 300 artisans. An average length of time for an apprenticeship was about eight years.[14] Silver vessels furthermore afforded numerous opportunities for artisans to copy or experiment with detailing techniques. As part of *Eléments d'Orfèvrerie* (1748), Pierre Germain, who had also apprenticed under Thomas Germain, compiled over 100 designs by other goldsmiths (seven of which were signed by Jacques Röettiers), laid out as separate templates to be adapted for individual styles.[15] This printed publication reached English goldsmith Thomas Heming and Swiss artisan G.M. Moser, who were able to access many

translated editions. With the exception of important commissions requiring more exhaustive sketches, silversmiths often modified others' designs for their own objectives, combining multiple variations on a singular theme. Other artisans working in the vicinity of Paris were not completely eclipsed by the high-caliber craftsmanship of the Germain family. Most of their designs, however, were melted down in the years surrounding 1759. Henri-Nicolas Cousinet, for example, was much remembered for his toilet set in gilded silver made for Queen Marie Leczinska in 1729 to celebrate the birth of the Dauphin. Antoine-Sébastien Durand, one of the goldsmiths patronized by Madame de Pompadour, had constructed a pair of mustard containers, each in the shape of a barrel set upon a wheelbarrow guided by a winged boy.[16]

Artistic volition shaped not only the physical material of a decorative object, but it also dictated the ensuing techniques employed for fabrication and the scope of the labor involved. Fiske Kimball has claimed, "silver, however, like every other human product, bears also in its design the impress of its time and of the artistic will of that time. That impress is one of the meanings of the word style: a characteristic mode of expression exhibiting the spirit and faculty of a nation, period, person, or school – the other meaning, closely related, being the quality which gives distinctive excellence."[17] With exceptions such as Meissonnier, he insists that such artisans passively followed creative leaders in the fields of architecture, sculpture, and painting, an interpretation that denies credence to artisans who were independent designers in their own right. Style, however, remains as only one minor factor in considering the overall design process undertaken by silversmiths.

Specialists who worked for master silversmiths were often denied their rightful authorship. A silversmith whose maker's mark was placed on the object was granted credit for the design; the actual fabrication of such pieces, however, was typically completed by well-trained journeymen, who were provided with a general sketch and a solid model from which to cast specific pieces. English firms such as Lamerie and Wickes may have employed full-time craftsmen, but most likely, these modellers were free-lance specialists, each with his own design repertoire. It is likely that these modellers were individually hired, behaving akin to modern-day sub-contractors. Sub-contracting labor to specialists, as shown by modern scholar John Styles, meant that a master craftsman, who was managing a workshop, did not have to pay for these tasks until particular portion of work was completed, so effectively obtaining credit for the period it took to complete. Such piece-work cost more than the amount paid to the journeymen in the workshop so careful judgment had to be employed to ascertain which arrangement would be the most advantageous.[18] This theory of sub-contractors, supported by Malcolm Baker among others, explained the presence of identical, easily recognizable ornament that had reappeared in varying workshops (though many goldsmiths could have loaned their models to fellow craftsmen but considering the secrecy and protection of such techniques, this seems to be an unlikely possibility). English chasers including George Daniel Gaab, John Gastrell, Augustin Heckel, John Valentine Haidt, Henry Manely, and Ishmael Parbury occasionally signed their pieces with their own names.[19]

English and French consumers were fascinated by mass-produced items for the home that combined artistic flair with industrial techniques, such as Matthew Boulton's candlesticks that used die-stamped metal sections for assembly at his Soho manufactory.

Invented by Thomas Boulsover in 1743, Sheffield plating was an advanced example of technological prescience, which consisted of metallic copper sandwiched between two thin layers of silver. The two metals together were employed in buttons, tea urns, coffee pots, saucepans, tankards, jugs, spoons, and forks.[20] In rethinking the condition of the decorative arts within art history, it is necessary to go beyond a methodological approach that narrowly assumes that social and cultural values may be derived from purely stylistic effects.[21] Manufacturing techniques such as Sheffield plating allow technology to become a starting point for the examination of art and design. Substituting whole metal with a shallow veneer allowed for affordable imitations at the fraction of the cost than fabricating an object entirely from silver or gold. Reed Benhamou argued that imitations of metallic alloys sometimes aroused animosity, less though in the eighteenth century than in the nineteenth century. In 1772, Nicolas-Pierre Severin fabricated the appearance of gold through the crafted application of varnishes to copper. She quotes pamphleteer Magnien, who in 1776 lamented that the "infinity of objects" trimmed with ormolu caused everywhere we see to be altered by illusion.[22] Imitations were perceived as opportunities for technical and economic expansion and not compromises of aesthetic taste.

Veneered silverware (*plaqué* or *doublé*), starting in 1768, became a budding success among French consumers, a fashionable trend borrowed from neighboring England. The marks on such objects never indicated the date of production but only provided the percentage of silver in relation to copper. Despite some overwhelming resistance from other silversmiths who disapproved of veneered silverware, Jean-Vincent Huguet, who became a master at the Gobelins manufactory, opened his own specialized

atelier in the Hotel de la Fère in 1770s Paris. Some of Huguet's pieces included a lacquered background, such as a terrine with silver handles whose painted body was decorated with ornate flowers that mimicked the style of Sèvres porcelain.[23]

Silver, as an artistic medium, was exploited for its superficial attributes of visual sheen and patina that was associated with luxury items. Its tendency for flamboyance was articulated through its formal qualities such as polish, reflection, and malleability. René Ménard in *Histoire des arts décoratifs, La décoration au XVIII siècle: Le style Louis XVI* (1892) relates that silverwork is too frequently associated with the metal of silver because of its "deep rich tones and profound crystal color."[24] Hence, the coloration of silver was conflated with the actual material itself, leading patrons and consumers to believe that high-end quality was intricately tied to silver's neutral tonality.

Transformations of metal between its liquid state and solid state may provide a vital clue to its sculptural ability and potential for assuming some of the organic forms prevalent among the decorative arts.[25] Solange Brault and Yves Bottineau have discussed the manner in which decoration was applied to metal surfaces during the casting process. For example, Bottineau dwells upon how Vitruvian scrolling was carefully applied to the circular rim of a vase:

> The *recingle* is a more complicated instrument that allows for working the interior of a théière, a cafetière, or any analogous object, to obtain the same preceding decoration; it is composed of a steel stem that folds two times at a right angle, and of which one extremity is placed in proximity to the metal inside the object; the other extremity is struck, the first, by reaction, bumping the metal turning it into relief (*la répousse*).[26]

By applying measured blows to the surface of the metal, a silversmith who employed burins (*ciselets*) could imprint profiles of grains or pearls into a decorative object. In

contrast, a *recingle* could form the relief of a motif by pushing the metal outwards, a convenient technique for objects such as coffee or tea press, which consisted of deep recesses. The specialized disposition of silversmithing, as noted by historian Marco Collareta, lent itself to a procedural complexity. Burins (*matoirs*) that hammered tiny grains or pearls onto the edges of vessels required great precision. Processes of burnishing and extrusion forced a silversmith to adjust for sealing, repetition of elements, and patterning. Fabrication techniques developed by silversmiths reveals their collective scientific expertise, political adaptations, and formal procedures that vacillated amidst changing social conditions.[27]

Georges Didi-Huberman in *La ressemblance par contact* (2008) implies that the circumstantial act of a physical impression upon the surface of a material, whether it be cavern rock or ceramic clay, draws together greater associations between an object and abstracted relations such as fantasies, myths, and other bodies of knowledge. This imprinting produces "a connective tissue of material relations which gives place to a concrete object" as a process and a paradigm.[28] A paradigm of this type demands a longer duration of such historical acts, ceases to function as a solely stand-alone referent but rather as a referent that stands outside of time. Through this concept, the fungibility of an object alludes to its manifold functions, appearances, and reconstitutions over consecutive time periods, even centuries.

Didi Huberman's imprinting describes the relational cross-overs between the malleability of metal and its corporeal character to assume multiple visual forms. We are provided with convincing examples of artisanal awareness and material techniques in the case of François-Thomas Germain (1726-1791), the fourth son of Thomas Germain.

Historian Germain Bapst (1853-1921) who had directed a workshop of metalworking and jewelry making, recounted the talents of Germain — "If M. Germain did not just copy the antique," he wrote, "and if, to lend to the reigning taste, he engages in singular forms...and as much he can he borrows the antique and good from masters all that they have is beautiful, and he embellishes them in his manner..."[29] Most of the visual motifs observed on his pieces were based upon preparatory molds inherited from his father, explaining the palpable verisimilitude between the works of father and son. Germain himself had prudently meditated upon the supposed role of an artisan:

> There was no question among us that Silverwork, although restricted in the past, was a profession whose entire mechanism consisted of the fusion of gold and silver, and in the fabrication of a few crude works. It is at the end of the century of Louis XIII, and the early times of Louis XIV, that it began to make progress. The Balins, the Launaies, the Germains appeared. Finally, what was only a profession became Art in the hands of these great men. Fashion, design, sculpture, painting, architecture, geometry, fable and history, so much of the different sciences became tributaries to their nascent Art.[30]

Silversmiths, according to Germain, deserved the reputation and credit accorded to fine artists, and the decorative arts, by extensions, could be considered a major genre of art in its own right. Frequently criticized for placing his own name on works bearing his father's maker's mark, François-Thomas Germain proposed novel ideas that validated his own technical skill and creative abilities.

In 1752, Germain claimed to have invented a new secret molding technique that resulted in the details of finer casts with a reduced need for reworking (though this theory was never completely proven, according to Bapst).[31] He boasted that he had discovered a new method of treating silver, which had not been substantiated by other contemporary sources. Metal, Bapst narrated, was often fused in a *creuset* made from refracted earth,

then poured into a mold; after cooled, it would take the shape of the desired vessel. In two distinct pieces, the mold was prepared from fine sand, held in place by an iron framework to keep them from loosening during the casting process. The mold was gently heated before the liquid metal, considered to be in a "soft state," could be poured. Within an object, given hollow components would be replicated by a core within the mold; the core itself was isolated inside the mold, supported by brass or iron rods. He referred to the type of sand needed to varnish the mold interiors for the silverwork, the material needed for the mold itself, and the ensuing treatment of the cast's interior surfaces:

> He must choose his sand for his molds, sifting with care, in verifying the composition and rigorously removing all foreign matter. Having obtained a mold of superior material than those previously used, he could subject it to much higher temperatures and therefore, at the moment of casting, obtain an identical temperature of that of the molten metal within the mold. The metal would lose the lumpy parts that occur when it meets the walls of the mold…this treatment had resulted in the production of objects most successful.[32]

This declaration provides some modest evidence of Germain's careful attention to the precise temperature of silver during the casting process, which was obligatory for developing smooth or more composite surfaces on tureens, sauciers, and cafetières. If the liquid metal in its soft state could match the temperature of the mold's interior, it would be plausible, in all likelihood, to manufacture an even finish for the work's surfaces. Even though this technique was unsubstantiated by Germain's contemporaries, it demonstrates his aptitude for considering metal's reactionary properties and his driven preoccupation with controlling his own manufacturing process.

Germain's awareness of and dexterity with composite casts was evident in his skilled execution of a dinner service for the Russian czarina Elisabeth Petrovna, who had

also commissioned three centerpieces to celebrate her victory over Frederick the Great at Kunesdorf in 1759. The showpiece *La machine d'argent* (1754) made for Christian Ludwig II (Duke of Mecklenburg), consisted of two game birds, an ortolan and a long-beaked snipe, strewn onto their backsides. A small dormant rabbit was unceremoniously draped across the platter, scattered with mushrooms and garlic and topped by a blossoming wedge of cauliflower. His maker's mark bore his initials underneath two grains and a crowned fleur-de-lis; the warden's mark, represented by a crowned letter O, used between July 13, 1754 and July 12, 1755, proved that the silver had been tested to meet the correct standard of every one thousand part of metal in any object, at least 958 parts of the metal had to be composed of pure silver.[33] *La machine d'argent*, for example, weighed roughly 11.57 pounds, a sum incised in German along with the full name of Germain and his title of *sculpteur-orfèvre du roy*. Germain's apartment in the Palais du Louvre was situated above the gateway to the rue Saint Thomas du Louvre while the painter Jean-Baptiste Oudry possessed a nearby studio and apartment in the Cour des Princes of the adjacent Tuileries Palace. **(Fig. 2.3)** Appointed by Christian Ludwig II, Duke of Mecklenburg, to complement the animal paintings by Oudry, Germain elevated the quantity of naturalism along with the subject of collected trophies from the hunt and demonstrated a level of complexity in the composition of the various casts, which were affixed as separate elements soldered together then secured with bolts, nuts, and screws on the underside of the centerpiece. Seen from below, *la machine d'argent*'s method of execution seems clumsy, but none of these ungainly efforts is evident from the exterior contours of the plump rabbit's corpse to the fine textures of the vegetables.

A high degree of craftsmanship was also manifested in the Portuguese king Joseph I's dinner service. After the disastrous earthquake of 1755 that struck Lisbon, Germain was certified to assemble new emblematic treasures for Joseph I's royal court; some of the works of notable distinction were saltshakers (*salières*) in the form of young boys clad in feather skirts and head-dresses meant to pay homage to the monarch's overseas Brazilian subjects.[34] Even in domestic objects, Orientalizing costuming captured salient aspects of cultural appearance yet often failed to appreciate the diversity of non-European colonial populations. Two Portuguese two salts and silver plates were apparently taken from Germain's atelier, an incident which Germain himself claimed was used to defame his flourishing reputation.[35] **(Fig. 2.4)** In his soupières, we witness a noticeable penchant for undulating surfaces that evolve into textural fabrics or organic fronds of leaves clasped by the cherubs on either end. The young boy gamboling with a goat on the lid melds into the other jumbled bodies coupled around him. **(Fig. 2.5)** The *Samovar*, as an unusual example, was emblazoned with a ram's head, flowery garlands, and a pumpkin boiler capped with the head of a Chinese grotesque. The neck of the teapot doubled as the throat of a dragon enfolded by the two crossed hands of the sinocized figure, who gazed outwards with a beatific smile. A swan's head graced the other handle providing counterpoised balance for the entire composition.

Germain's decorative style fluctuated depending on the type of object commissioned and the patron by whom he was employed. Among some of the other items designed for the Portuguese court not held in the Musée Gulbenkian, an olive spoon with the arms of the Rainier de Guerchy family created in 1759 remains at the Musée des arts décoratifs in Lyon, probably utilized to pluck out bits of meat from a

tureen filled with sauce. As the museum's description indicates, cutlery cabinets did not appear before the beginning of the eighteenth century, and typically, two separate artisans created each type of cutlery, one who specialized in forks and spoons and the other in knives.[36] A three-branch candelabra created for the Russian court bears Germain's poinçon in several places as well that of the Russian inspection mark.[37] Six soup tureens and six pots-à-oille, delivered to Russia in 1761, were particularly neoclassical. **(Fig. 2.6)** Germain's candlesticks articulate a multitude of scalloped and rounded edges, from their naturalistic leaves and chaplets, abstracted open-faced shells, and interlocked banding around each section. These combined effects present a highly textured composition that engenders an organic sensibility.

**(Fig. 2.7)** In comparison with Germain's design, Michel Maillard's (1725-1786) flambeaux from 1749 do not possess any flagrant or farfetched forms; they are adorned with simple beading around each base, swirled fluting, and simple flared profiles around each member of the composition. **(Fig. 2.8)** A far more stoic appearance is likewise present in Jacques-Nicolas Röettiers de la Tour's matching candlestick holders, which bear scaled-down details of braided garlands around their base, proportioned plaques with elliptical centers on the body of the vessels, and even-spaced banding with framed freizes around each narrowed profile of the piece. Compared together, these three designs exemplify more similarities than radical differences. Germain's candlestick holders have similar leaf motifs to the Maillard pair. The universal shortage of substantial commissions from the fallout of the Seven Years' War made it difficult for Germain to finance his lavish lifestyle and the daily operations of his workshop. In 1765, he sold the entire contents of his workshop, intending to remain artistic director but struggled with

managing his finances. He became bankrupt later that year, was forced from his lodgings at the Louvre, and died in relative obscurity in 1791.

Comparable to Germain, Jacques Röettiers (1707-1784) demonstrated a wide range of techniques for many of his silver vessels. He hailed from a family of Antwerp medalists and had also spent considerable time working in the ateliers of Thomas Germain and Nicolas Besnier, whose daughter he married in 1734. His 168-piece dinner service for the Berkeley family in England is now held in the Stavros Niarchos Collection. Exuberant crayfish and vegetables that adorn the lids of the tureens and pots-à-oille were perhaps taken from Meissonnier's *Livre de Légumes*, resembling a fusion of regency style interspersed with rococo features.[38] Commissioned by the third Count of Berkeley, it comprised two terrines, two pots-à oille, a series of sixteen round and oval platters of diverse sizes, fifty-two dishes, two salt-pepper dispensers, four simple salt shakers, two oil and vinegar sets, three powdered sugar holders, six candelabra, twenty-four pieces of cutlery and various ladles, ragout spoons, etc., all weighing more than 110 kilos. Röettiers later adopted more classical and architectural motifs into his designs of vases decorated with bas-reliefs and gold sugar containers, parodying the labor of sugar-making being completed by African slaves.[39]

Röettiers had enlisted four other workshops to help produce the 3,000 pieces necessary for the Orloff service ordered by Catherine II of Russia. **(Fig. 2.9)** His son Jacques-Nicolas Röettiers de la Tour (1733-1788) soon followed suit producing a range of objects with neoclassical features. **(Fig. 2.10)** As one of the most important dishes, this *pot à oille* as part of the Orloff service was typically accompanied by oval-shaped terrines and featured cooked meats in sauce. Maria-Theresa imported this same type of dish from

Spain after her marriage to Louis XV had taken place. A sauceboat by Joseph-Théodore Vancombert bore two wrapped handles and a rather smooth exterior on the body of the object.[40]

Stylistic differences between analogous models necessitated varied techniques that were identified as either rococo or neoclassical elements. **(Fig. 2.11)** Claude-Dominique Vinsac's drawn elevation arranges four variations on the structure of the saltshaker's legs. In the first, large curved open-mouthed dolphins lay upon either side; outstretched egrets prance around the second model, touching their beaks to the festooned edge of an urn. The remaining two vessels appear as rococo and neoclassical composites – each with severed goat or faun heads adorning garlanded surfaces of the piece. With the exception of the outscaled goat hooves, most of the visual qualities of these vessels conjure neoclassical features; the hybrid mixtures of motifs and styles obscure our identification of these pieces that disengage form from practical function.

Decorative objects made for royalty were not the only items that exhibited the hallmarks of sumptuous craftsmanship. Bouillon bowls, or *écuelles*, made for commoners by artisans Jacques Henri Alberti, Fritz Jean-Jacques Kirstein, and Ludwig III Imlin, for example, became immensely popular in 1760s Strasbourg. One particular version was fitted as part of an individual traveling set, complete with a personal plate, fork, spoon, and knife held in a leather case **(Fig. 2.12)** An écuelle, described by Richelet, was a vessel with two "ears," used for holding soup, often composed of metal, wood, faience, or earthenware. A gadrooned beaker such as the one produced by Jean-Jacques Ehrlen in 1764 was a personal object used while traveling, an occurrence rarely encountered in production.[41] Stamped with a mark for the city of Strasbourg and the warden's letter for

1768, a silver-gilt écuelle by Louis Imlin, Jr., also with a corresponding spoon and fork with the markers from different makers bear free renderings of naturalistic flowers that were common in this area with art objects in wood, stone, ceramics, and metalwork. Many pieces are now found in the Languedoc region, rather than in Strasbourg, including the Imlin piece that had once belonged to the family of Du Bourg.[42]

**Substance economy for a nation**

As modelers, smelters, chasers, engravers, or enamellers, goldsmiths or silversmiths possessed an eclectic sampling of knowledge, "an experience of art and technique that permitted them to enlarge their circle of their works."[43] Jéremie Cotte remarks that in fourteenth-century France around 1514, the striking of gold and silver was considered an open, if not overtly liberal, activity, allowing any person to bring precious metals to the royal ateliers in order to have surplus coinage forged from retrieved materials. Individual artisanal traders often sometimes intervened in this process, concocting their own "commerce in precious objects and changing French and foreign monies" by gathering random amounts of metal to be brought to the Hotel des Monnaies as *rabatteurs* (beaters).[44] Journeymen eventually became more organized in numbers, offering communal protection, the support of fellow artisans, and affiliated legal jurisdiction rights under the organization of corporations.

Many corporations were clustered together under unrelated criterion, which, by today's standards, may not be comprehensible. Rope-makers were associated with retailers and merchants, who sold vegetables and cheese. In Strasbourg, silversmiths were members of the l'Echasse corporation, which also included other trades including

jewelers, glass blowers, painters, sculptors, gilders, varnishers, printers and typesetters, book binders and sellers, engravers, instrument makers, porcelain makers, while gold-chiselers were placed together with blacksmiths. In 1790, Strasbourgian authorities lifted a corporate ban on the division of social classes that were imposed upon each type of corporation. Without restrictions on income or religious preference, poorer tradesmen were allowed to consort with lawyers, and Protestants were permitted to succeed Catholic officials. [45]

Metalworking was not simply put into the service of seigneurs, the bourgeoisie, and members of civil society, but in tandem, significant pieces were produced for local churches and the religious laity. In 1700, goldsmiths were forbidden to possess any object of gold above the weight of one ounce, with the exception of Episcopal and bishop crosses, insignias from the knights of orders, and watch chains. The sanctioned melting of precious metals, included usable components taken from church bells, copper cannons, to ornamental furniture, had been a longstanding practice dating back to the earliest Roman sieges and continuing until the nineteenth-century Prussian War.[46]

Religious iconoclasm, from the English Reformation under Henry VIII to the 1566 Dutch Revolt, sought to banish or reclaim symbolic art for both economic and political purposes. A cataclysmic melting of precious metals occurred in the 1690s, demonstrating that iconoclastic reclamation of materials was not an isolated historical event. Symbolic objects, harboring dissonance between content and form, used visual motifs taken from nature and extended their meaning by revealing a glimpse of profound divine ideas.[47] Historian Ernest Labrousse, who analyzed wages, prices, and revenues during periods of economic crisis during the ancien régime, tracked the preindustrial

grain economy and class frictions that precipitated the French Revolution. In examining times of economic crisis, we may be able to elicit greater conclusions about the decisive role of art objects and their importance for the security of the French state. There were sizeable aggregates of metal readily accessible during the Seven Years' War. Utility was the primary cause for converting dishes and silverware into fiscal currency "at the same time as a means of augmenting circulation," for the honorable well-being of the French state.[48]

Melting down precious metals was not a novel phenomenon; in fact, this event possessed an extensive lineage throughout Europe and the rest of the world. Dating as far back as the third-century Roman empire, scrap copper and bronze were recycled into armor, weaponry, personal articles such as mirrors, and commemorative statues. For our purposes, the immediate precursor to the French Revolution was the set of conditions determined by the Seven Years' War. To pay off the burgeoning debts from the Seven Years' War, the French crown demanded that loyal citizens ferry varying quantities of domestic silverware and ornament made from precious gold to the Paris mint. Many different decorative objects were brought to the Parisian mint, which made it difficult for bureaucratic officials to decipher how much silver was appropriate compensation. Table services, in particular those formerly owned by the royal family or foreign aristocracy, were classified by distinctive features of quality, quantity, and weight. Raised dishware (*montée*) was typically addressed as a separate categorical item. 56 livres was paid for flat dishware marked with the poinçon of Paris; 55 livres, 3 sols, 6 deniers for similar dishes with the same marker, 54 livres 7 sols for a more flattened dish originating from the French provinces.[49] Until the entire sum was paid to an owner, the bearer of the mint

in trusted standing delivered a quarter of the designated debt. The rest was delivered in a year's time from the date of remittance (typically paid in silver); as compensation, an indemnity of five percent per year was given. Due to this complicated arrangement, three deniers per marc were to be paid by the materials' proprietors, which decreased the quarter of the total amount they were owed. Deductions were also then taken for the cost of fabrication and scraps of metal. Sums were then remitted to owners who supplied such precious metal objects.[50]

According to archival documents from 1759-1762, Louis XV had set fixed rates for the exchange and evaluation of gold and silver gained from the collection of materials, vessels, and works made from metals, to be paid directly to the Hôtels des Monnoies. For a marc made of twenty-four karat gold, a man was compensated with 861 livres and seven sols. For plated earthenware or dishes marked with the poinçon of Paris, an object of four ounces would be paid twenty-eight livres whereas an object with a poinçon of a provincial location would be paid slightly less, around twenty-seven livres, three sols, six deniers.[51] Under the Director of the French Mint, pieces from complete dinner services and copious amounts of dishes from families' tables would be brought continuously to the government mint to be converted into cash, after being registered by the Receiver of Change, who would deliver a registered extract with detailed information on the quality, quantity, and weight of the objects being ferried to the treasuries.[52] In another patent letter ordained on February 8, 1760, the administrators of ecclesiastical, secular and regular corps and communities were ordered to deposit all silver, even those in use for church services and worship of the altar. Similar rates were set for goods labeled as religious silver.[53] Submitted on February 29, 1760, another edict called for all

tableware and silverware from churches and ecclesiastical communities, received or paid for by the king's subjects.[54]

From January 1, 1761 in the city of Lyon, the *droit de marque*, a monetary amount collected for each piece *marc de lingot*, was set aside to become converted features of silver. The immediate protection surrounding the commerce of gold and silver braids as well as other materials enriched by the these metals decreased as a result of the suppression of the *droit de marque*, grasped as a profit scheme for Paris and Lyon. Each lingot was to be marked with a distinct number in a unique series, to be restarted each year. The refinement of gold and silver was also closely monitored, with these fees paid directly by the merchants or workers, either in cash or materials.[55] Once precious metals were melted down, their economic worth was reevaluated again, providing a numeric value that was testament to their usefulness as crude capital.

Clamoring for a standard method of testing gold and silver, messieurs Helot, Macquer, and Tillet from the Académie des Sciences on November 26, 1762 decided to select a method of testing for each sample of metal, in order to detect traces of lead and to determine the quality of the vessels used for evaluation. These early scientists were also held responsible for the original fabrication of other objects that needed to meet these exact standards. Specific types of testing vessels for the given production of metallic alloys were meticulously described, some of which contained calcinated chalk bone, perfectly washed and passed through a fine-mesh sieve. Dosages of lead were to be proportioned into precise matching amounts, and for example, eighteen grams of silver was allowed for each trial that was undertaken.[56] Laboratory experiments on alloys were

carefully monitored in order to perfect the accurate mix of metallic elements needed for the economic value and accurate weight of currency.

From the laboratory of the French mint to the free markets, even art objects containing small amounts of precious metals bound for foreign destinations were stringently controlled. Marchands-orfèvres, merciers, bijoutiers, and all other artisans involved in the creation of *tabatières* were subject to this law from December 2, 1765 that dictated which type of goods could be labeled, priced, and sold.[57] To manage extensive trade beyond the limits of France's borders, the royal authority of the Contrôleur Général des Finances closely monitored the movements of decorative cutlery and earthenware with silver and gold, exported to the New Atlantic former colonies such as the nascent United States of America and other overseas countries that received continental goods sold for a profit. It had employed two levels of fees that were reduced beginning in July 1766 managed by the Bureau de la Douane.[58]

> ...That the artist found, by this ingenious mixture of gold with silver, a means of gently treating the most precious material to the satisfaction of cheap taste and public curiosity: that the only inconvenience which could result in these types of tabatières, [believed to be entirely of gold], is that someone could be considerably wrong in buying them, or of some faithless worker, or anyone in particular whose hands they have passed, which will consequently occasion discredit to trade within the kingdom and abroad.[59]

Gold mixed with silver was perceived as a deceptive maneuver to exploit the untrained eye of an ignorant consumer. Jewelers shared the same belief that metals, as well as distinct types of precious stones, should be kept separate in a design composition. To create or sell whole boxes of silver encrusted with gold on the exterior, perhaps designed with different colors, with gold hinges or enclosures, silversmiths were to engrave the

word "Argent" onto the interior surface of the box or in the most visible location, applied as a *poinçon de décharge*, or as a letter A. In contrast to the former *Statuts et priviléges du corps des marchands orfèvres-joailliers de la ville de Paris* that contained original legislation dating from 1679, which also affected affineurs, batteurs, graveurs, horlogers, and lapidaires, reprinted by Pierre le Roy in 1734 and 1759, there were a number of regulations that had been changed or repealed. The mixing of metals, for instance, in the late eighteenth century was encouraged in assorted styles of decorative objects, particularly silver and gold tabatières.[60]

By June 30, 1762, furniture owned by deceased aristocrats was added to the ever-growing list of objects to be brought to Hotels des Monnöies, and sales of foreign silverware, even those items which were made from low-grade materials, marked with false poinçons, or invented for the purposes of fraud, sold by fine furniture merchants complicated what was already a complex, structured process of recovery. Armchairs, writing desks, and chaise lounges festooned with high-grade silver or gold gilding were mandated as the mint's assets, not to be made available at public auctions (even if they had been primarily purchased on the open market).[61]

Outlying cities such as Lyon were governed by comparable regulations issued by the Departmental Committee of Surveillance and Public Security that dictated citizens bring their precious objects to a central mint location.[62] From the provinces of Clermont to Lorraine, silver and gold were carried in varying quantities to the central locations designated by the Paris mint. During the eighteenth century, four types of markers were extensively employed – a maker's mark, a mark of charge (put on the object while under construction), a mark of discharge (typically small, when the object was completed), and

a *maison commune* (to warrant the fineness of the silver). Marks of charge and discharge were sometimes renewed for every modification of a tax inspector. Labeled pieces that were expressly held for purposes of retail, pieces stamped by a previous tax inspector, or older objects that had been repaired or restored with new parts each possessed distinct marks that indicated their purpose and category. Silverware manufactured in Paris between 1768 and 1789 sometimes bore a mark of *discharge gratis*, which exempted an item from the payment of duties by royal privilege. An eagle with its head turned in profile, as a general poinçon for example, graced any works of silver created abroad that entered Lyon. Guarantees and titles of gold and silver (1797) that verified the proper weight for each grade of metal bore variations on the same symbol, a standing rooster with an opened beak compared with one with outstretched wings for a lesser rating of silver.[63]

The expressive combination of metals and materials utilized in an artwork was denoted with an engraving of a word or character approved by the government, which bolstered consumer confidence and discouraged the fabrication of illegal copies. *Colporteurs*, or hawkers, of false goods were widely prevalent. According to critic Pignatel, it was in the public interest to use silver and gold in order to stabilize the economy of the New Republic, assuring the fiscal values of precious metals, but the government should not authorize silversmiths to control the prices of metals and their works for their own profit. Jean-Marie Darnis, archivist at the Monnaie de Paris, argues that different types of metals used to make pieces of currency varied in function by their "economic hierarchy," and to augment the resistance of silver and gold, it was necessary to mix them with copper. Disparate metallic alloys were assigned specific legislative

titles that were approved by the government. In quoting Darnis, "metals and natural resources of the earth embodied the financial prosperity of French sovereignty and the national state."[64]

**Calonne's Reform (1785)**

Mary Poovey argues that monetary genres are essential to the problematic of representation. Money itself was a form of representation. Government policing between valid or invalid money united discourses about economics, finance, and even imaginative literature of the eighteenth century. The stylistic features of monetary instruments determined the way in which an object was allowed to mediate value.[65] Naturalization, or systems of man-made values, erased the historical relationship between the genre of economic writing and imaginative pamphlets about the role of money. What she calls "third order" instruments — bills of exchange, bank paper, and checks — related their economic value back to gold and silver, precious metals that were scarce, easily divisible, stable in terms of their volume, and had minimal price fluctuations.[66] Before the age of banknotes, visual patterns of identification were necessary to distinguish minted coins from counterfeits. The value of a coin was predicated upon the sheer indexicality created through processes of mechanical imprinting, and this act of reproduction relied upon the cultural assumption that all valid copies could and would be fabricated in the same way.[67] All arts, including the designs of coins and medals, are accepted as autographic, or being handmade by their authors, who were either designers or executors of a design. At some point, these same arts become allographic, scripted by their authors to be executed intentionally by others. The indexicality of a coin is thus related to ways in which artisans

executed their designs and techniques to make each coin look and feel like the ones that were manufactured beforehand.[68]

Gold, the universal standard by which other metals were judged, performed a strategic role in the monetary reform instituted on October 30, 1785 by Charles Alexander Calonne. As Louis XVI's unpopular finance minister, he was accused of manipulating the stock market in favor of his own family members and allies, engineering a market crash in 1785-87.[69] The French state was facing dismal bankruptcy due to the royal court's excessive spending, and the ensuing political crisis of 1787-1788 arose from the financial problems of the Bourbon monarchy. Calonne had urged the king to set up an elite national body, the Assembly of Notables, to endorse a package of radical tax amendments. He had launched this initiative as a means of introducing pieces of gold as a lynchpin of legislative reform. The devaluation of French currency coincided with the diminished value of French gold not in title, but the weight of metals had to be realigned with the matching standards of Spain, Portugal, and England.[70]

The use-value of materials such as metal was tested and recreated several times during its transformations from a work of art, to raw brute material, into economic currency. During the same year of Louis XVI and Marie Antoinette's flight to Varennes (1791), a coin with the bust of Mirabeau created in Lyon bore some emphatic words: "PUR METAL DE CLOCHE FRAPPE PAR LES ARTISTES REUNIS DE LYON LE XXIV. 7bre LAN IV DE LA LIBERTE 1er DE L'EGALITE." Artists in Lyon, for instance, had been utilizing the metal taken from bells and transforming them into medals. In another drawn profile of a coin struck in Rouen, metal redeemed from the bells of Georces d'Amboise, created in 1501, was destroyed and then changed into a

commemorative coin in 1793. A "monument of vanity," representative of a selfish gesture to autocratic desires, had been taken apart for the utility during the second year. Common sense coupled with public utility was the preferred route for most citizens living in revolutionary times.

Bountiful sources of gold and silver during the last years of the revolution were relatively rare; the numeric ratio between the two precious metals, being quite uneven, was to be alleviated by the passage of the Calonne reform. To counteract the hoarding of gold and a simultaneously flooding of the market caused by the poor manufacturing of currency and counterfeit monies, the French Treasury had wished to fill their coffers by fixing the numerical ratio between silver and gold to improve the standing worth of the present currency. The Directory introduced paper currency, known commonly as assignats, in March 1796, and this shift of currency eventually failed since a lack of consumer faith in the bank bills overran public sentiment.[71]

Darnis implies that the new experience of paper money was brought about by the Calonne reform and the organizational administration of the government mint, its technologies, and the ancestral conception of finances that had been completely overtaken by the deficit of two and a half million livres owed to a fledgling United States of America. Paper assignats amplified the state's affluence by taxing anti-revolutionary currency. In provoking the descent of the assignat, the unexpected inconvertibility of bills and the emissions of untenable paper money destabilized their worth in relation to precious metals.[72] The Assemblée Nationale had believed that metallic currency had run out and was forced to make assignats legal tender for the national welfare.[73] Assignats later gained an especially collectible, if not sentimental, value, transformed into motifs

for trompe d'oeil surfaces of card tables and paper fans imprinted with 400 livres bills depicting the Phrygian bonnet and 2-décimes showing "Liberté au bonnet," mounted onto pieces of wood attached to bone.[74]

The franc gained its equivalent in silver as a mode of national currency by the French Revolutionary Convention in 1795. One franc, or ten decimes or one hundred centimes, became a decimal unit of 4.5g of fine silver, and in 1796, the franc was set as 1.0125 livres or one livre, three deniers. Plagued by sub-standard coins, the circulation of this currency declined greatly during the Republic when gold and silver reserves were exchanged against printed assignats that were originally intended as bonds based on the value of confiscated goods of churches (later declared as legal tender). Too many assignats, as a result, were placed into distribution through the overvaluing of national properties; the silver franc was thus rarefied and used to pay foreign providers. The unpaid national debt caused decreased public faith in the assignat, in addition to a shortage of silver for producing metallized francs, hyperinflation, and political instability that plagued government authorities, who were unable to control the fizzling value of paper currency.[75]

**Violent conversions**

In returning to the scarcity of metallic resources, Louis XIV through Louis XVI were collectively responsible for the mass disappearance of precious decorative works of art and other objects that contained precious metals beginning in the 1690s. Joseph-Siffrède Duplessis' portrait illustrated Louis XVI, who is draped in white ermine with the jeweled St. Esprit cross and complemented by the rich textures of purple cloth dotted

with golden fleur-de-lys, the blue brocade of the chair next to him, and the jeweled crown placed at his left-hand side.[76] An identity of prodigious wealth, contrary to the ongoing eradication of precious metals, was maintained in the visual semblance of his portraits in painting and numismatics.

Distinguishing between destructive causes of vandalism and those more restorative in disposition, Louis Réau imagines dividing types of violent activities, by the actors involved, their motives, and their effects upon such objects, whether they were individual, collective, or institutional. During Spain's succession in 1709, "the state of finances was not ameliorated by this disastrous operation which, transformed brute lingots into a multitude of objects of art," Réau asserts, "and disappeared forever, into the crucibles of the Mint, vases, torchières, candelabra and girandoles, pedestals..."[77] Suffering from these substantial losses, Parisian manufacturers at Pont-aux-Choux still managed to create badly crafted copies from copper alloys, which were simulated, doubled, or used as a veneer that imitated silver or gold models conceived by silversmiths. Much of the copious metalwork as well as architectural elements that contained precious metals destroyed during the French Revolution left behind few written records or proof of existence.[78]

Louis XV delivered most of his silverware to the mint with the allowance of a few works of "exceptional beauty," such as the 1726 toilette set of the Dauphine executed by Thomas Germain.[79] Louis XV had his lawyer Barbier present each night a list of compliant subjects who had delivered their silverware to prove their submission to the crown and their zeal for the French state's prosperity. Those from the chapter of the Notre Dame Cathedral brought the trimmings of an altarpiece composed of a cross,

chandeliers, and torchières in silver executed by Claude Ballin, which became replaced in 1760 by a more modest version in bronze designed by Philippe Caffieri. The reluctant clergy of the Cathedral of Sens was resigned to offer its antependium, as old as the one situated in St. Denis from the tenth century, and a table of gold that was eventually lessened to five lingots.

Religious artifacts were not spared from the cupidity of robbers and were equally vulnerable to become pieces of coinage as the ornament of the Catholic faith qualified as "rattles of fanaticism." The church of Elne in Roussillon possessed a fourteenth-century retable that was replaced by a Roman baldacchino in 1721. Among these incidents, Dario Gamboni relates the unknown fate of a fourteenth-century scepter. A report on the royal tombs at St. Denis proposed to exempt the top of a scepter from melting since it epitomized a "piece of fourteenth-century goldsmith's art." Gilbert Romme pointed out that the fleur-de-lys had been "a token of pride for the kings and a national stamp for the arts."[80] Visual motifs of art such as the fleur-de-lys were partially assessed for their aesthetic craftsmanship in relation to their past affiliations with the powers of sovereign royalty waning rapidly and the mounting spirit of revolutionary patriotism gaining pace. Their ambivalent status, wavering between historical evidence and unworthy detritus, depended upon the perceptions of their discrete components such as a fleur-de-lis.

Richard Clay has deliberated on the role of Catholic objects during the French Revolution and how they were treated primarily for their non-aesthetic aspects.[81] The Cathedral of Amiens surrendered its silver choir weighing 300 marcs under orders from Louis XV. To the profound chagrin of the bishop, his own clergy members hastened to procure brass candlesticks or other metals that were not redeemable for money.[82] On

September 29, 1789, the National Assembly invited bishops, curés, and brotherhoods to bring to the Hôtel des Mönnaies all of the silver of churches that were not in the interest of the divine cult. Declaring church property as belonging to the state, the National Constituent Assembly soon confiscated lands and sold all of them at auction. Another law voted upon on October 23, 1790 ordained that the directories of districts should sell their silver, and another decree on September 10, 1792, justified these legal dispositions and actions in favor of public salvation, to convert these metals into currency, which would pay for the upkeep of various French armies: "The National Assembly, considering that utensils of gold and silver employed in the service of worship conserved in the churches are of pure ostentation and do not agree with the simplicity that should accompany this service: that when the Fatherland is in danger and that needs are urgent, it is necessary to address the resources which could be employed without burdening the citizens..."[83]

Some of the prized treasures of Sainte-Chapelle — namely a 1306 gold reliquary of St. Louis commanded by Philippe the Beautiful to silversmith Guillaume Julien and the châsse of St. Genevieve, which had been transferred to the parish church of St. Etienne-du-Mont — were melted down in 1793. In Lyon, which possessed more than one hundred churches within its own borders, the women of the Visitation did not passively wait for the anticipated pillage of the intruding army; instead, they delivered a silver bust of their patron saint François de Sales directly to the mint themselves. The municipal council of Saint-Sylvestre decided that all copper in churches should be sent to Limoges where they were destined for the Chaudière, while the abbey of Grandmont contributed two censers and their shuttles, five chandeliers, all of which weighed a quintal.

Silver and gold were not the only precious metals requisitioned in service of Republican ideals: diamonds and jewelry were occasionally demanded. In a volatile atmosphere permeated by blatant anti-Catholicism, the Jacobins declared an open war against the presence of bells whose visual domination of edifices, they believed, were contrary to the principles of egalitarianism. The bronze bells from the Théatins, Petits-Augustins, Sainte-Marie l'Egyptienne, were to be melted down, and a decree from July 23, 1793 avowed that not a single bell should be secured in a church. Churches and abbeys, in national interests, were deliberately abandoned; any materials from idols were confiscated in the interests of the state. Monastic buildings were comandeered as manufacturing areas for industrial production. Roofing lead, armatures from glass windows and coffins employed for bullets, bars of iron from the grillwork of choirs to forge pikes, bronze from funerary monuments and bells to build military cannons, were all destined to become arms for the Republic forces.[84] Even the tapestries kept at the Garde Meuble were not exempt. Under the Directory in 1797, Louis XVI gave the authorization to burn twenty-eight hangings of considerable merit and to retain the leftover metallic vermeil for their financial value, since these were "objects rendered useless by their dilapidation and of no service to the arts by their bad taste in design" and whose "indecent subjects" were rendered in badly faded silk.[85]

Provincial documents acquired from the administrative offices of the Musée de Monnaie reveal details about specific objects and remaining quantities of metals that were collected during the revolutionary years. Suppressed ecclesiastical establishments, from the Varennes reliquary, Beauchamp priory, and the abbeys of la Challade and Beaulieu, were stripped of many types of items — chalices, censers, a ciborium, a

ceremonial shuttle, trimmings on a cross, Christ figures, ragout spoons with six covers, two plaques, the valuable decoration from a book, and several monstrances adorned with crystals.[86] In a list from the Meuse region, church materials were sub-divided into vermeil, braids, fabric, and copper that was enrobed either in silver and gold.[87] Similarly, districts in the Vosges region held analogous documents detailing objects — salt shakers, forks, knives, coffee holders, water pitchers, chocolatiers, goblets — owned by a private citizen that were consigned to the melting pot.[88] Silver buckles, café spoons, bowls, and watches were donated in the same year in the Rhône vicinity.[89]

According to Jean Starobinski, the style of the revolution paralleled aesthetic style in the visual arts of the period. The French Revolution, he asserts, "imposes a universal criterion, distinguishing what is modern from what is obsolete. It introduces and applies a new norm of social relationship, a norm that works of art are forced either to accept or reject."[90] L'Abbé Henri Gregoire (1750-1831), Lorraine clergyman deputy of the General Estates and founder of the Conservatoire national des arts et métiers, in his address during the Convention le 14 fructidor on August 31, 1794, referred to the destructive attitudes of the Republican army as *vandaliste*. Marking those who sought to pillage and wreck civic monuments and royal sculpture, Gregoire deemed such individuals as being detrimental to the process of rebuilding France's patrimonial heritage. Against the revolution's language of "new Babel," hostile intellectuals such as Edmund Burke wielded old Latin to combat the dangerous rhetoric that threatened to tear man from his history and heritage.[91] Violence, coupled with rebirth and reformulation, became a catalyst for the French state to renew its own changing identity through verbal and visual representations. Floods, lightning, volcanic eruptions, and earthquakes, as metaphors and

similes, found their way into revolutionary festivals, plays, and the language of political speeches. These rhetorical devices taken from classical, mythological, and biblical sources elucidated claims to authority, sovereignty, and responsibility, conflating natural and political processes to structure ordinary citizens' comprehension of the Revolution's aims; they could certainly shape and constrain the actions of legislative leadership, limiting public dissent.[92]

These calamitous images manifested themselves in the representative canvases of Hubert Robert, who painted the mass destruction of monuments, museums, churches, and houses that were transformed for the city's principal streets and bridges. His dramatic rendering of the destruction of Saint-Jean-en-Grève in Paris situated a warm orange burst of flame and heat, surrounded by white smoke, emanating from the heart of the church, whose shell is framed by the impartial towers in the background.[93] Pierre-Antoine Demachy's (1723-1807) portrayal of the dismantling of the Louvre's colonnade (1764) depicted a crew of men pulling down pieces of timber, hauling away wood, with a few female bystanders watching **(Fig. 2.13)** With ruins dominating the forefront of the composition and the museum's grand facade, a comparison between the wreckage and the composed grandeur of the former regime proposes a new vision of urban renewal that arises from the distinctions between old institutions and future constructions. Iron rods that pierce through stone remain in Demachy's image of the Church of St. Innocent (1787), whose arcades are buried in gaping piles of rubble. The Hôtel des Monnaies as viewed from the Pont Neuf (1793), is composed of picturesque boulders and antiquarian formations traversed by a curious public that become part of an assembled, naturalized landscape against the scene of the city.

In portending an uncertain economic climate filled with risk, Robert's image of the Sorbonne church (1800), set against an open view of the sky with its abutting façade, is framed by angled timbers set at splayed angles across the painting's composition. The building, however, was later restored during the Second Empire. Nina Dubin's reading of Robert's imagery situates his buildings against a culture of catastrophic decline initiated by troublesome financial speculation. However, her well-executed interpretation, aligned with vehement illustrations of volcanic eruptions in scientific journals, still relies upon the conventional trope of ruined constructions indicative of ancient eras as models for alternative futures. As projections of imminent renewal, ruins maintained definitive traces of Romanticism where classical antiquity and sublime perspectives co-mingled with historical forces.

Gamboni, separating aesthetic forms of artifacts from their symbolic content, avows that art is valued and devalued in line with certain political beliefs that either advocate for the destruction or preservation of given variations of an artwork. Objects' identities, he insists, are multi-faceted, sometimes contradictory in character, imbued with values that shift dramatically from their authors, spectators, to their users. Iconoclasm included not only the dilution of spiritual content but also the growth of aesthetic articulation as a means of propagating two distinct agendas: the preservation of given motifs in the interest of art or for the sake of history and memory, within a legislative, judicial framework that would legitimate such actions. In this sense, some of the ornamental works discussed so far in this chapter were salvaged for their nostalgic or aesthetic craftsmanship. Other art objects from outlying French provinces were not so fortunate and condemned to the collective melting pot.

A related concept to iconoclastic destruction is philosopher Martin Heidegger's *sous rature* – under erasure – that exposes a signifier that is not wholly suitable for the concept it represents. For example, Richard Wrigley proposes that Jacques Derrida's variation of *rature*, which encloses the act of erasure and reuse, argues that modifications concerned with visual motifs such as coats of arms and written inscriptions dissociated works of art from their original sites or places and functions and redefined them as new entities. The reusage or recycling of fragments, materials, or physical sites, aimed at commemorating the subsequent replacement of the ancien regime.[94] New signifiers no longer belonged to the form of an old object and on the contrary, blended pre-existing cultural meanings with new conceptions of revolutionary duration and patriotism.

Before the revolution of 1789, the state of industrialization in France had attempted to emulate the successful practices of the British model, which eventually foundered in the statist economy that encouraged technological innovation and entrepreneurial progress. Accelerated wealth and proliferating "useful knowledge" was tempered by the inefficiencies of any type of production regime.

The French government allowed enough economic liberty for citizens to innovate yet, as historian Jeff Horn's interpretation entails, there was too much license that permitted the production of poor-quality items.[95] Luxury trades and the extensive labor needed to sustain these trades were concentrated in the old city of Paris. Around mid-century, there was estimated to be around 50,000 artisans and industrial workers, and by 1789, this figure rose closer to 100,000. By shifting state control away from the means of production, consumer industries such as those of porcelain, glass, jewelry, watch-making, staged a strong revival in the 1790s. A new cotton industry was breaking all records for

growth. The continued presence of a skilled workforce, the availability of capital, the readiness of factory-style buildings (in the form of disused ecclesiastic constructions) were to the advantage of canny manufacturers. In 1798, Minister of the Interior François de Neufchâteau organized an industrial exposition on the Champ de Mars to try to show the rest of Europe that Paris was, in fact, a notable competitor. There were over a hundred exhibits, including Gobelins tapestries, fashionable clothes and wallpapers among the consumer goods, plus a steam engine, examples of industrial metalwork and chemical techniques to signal Paris' inventive and productive side."[96] French craftsmanship, however, would thrive into the revolutionary years, continuing to produce luxury items for an endangered aristocratic clientele.

**Collecting paradigmatic contents**

In turning from the historical conditions under which decorative ornament was conceived and executed, we must now attend to another form of artistic production, the medal, which was created from these cast-off yet costly materials. **(Fig. 2.14)** Jean-Siméon Chardin's ironic *Le singe antiquaire* (1726) showcased a monkey leisurely garbed in gentleman's beige robes with cuffed sleeves, who, with nonchalant ease, casually inspected a medal with a magnifying glass.[97] Behind him, a chest of drawers, each containing most likely with various coins and monetary souvenirs befitting that of a connoisseur, is opened. Several leather-bound tomes, splayed in haphazard fashion, filled with illustrated plates featuring the double faces of medals lie beneath on a velvet cushion footstool. For Chardin, who retained a somewhat peaked disdain for men who cultivated pseudo-intellectual foibles, the connoisseur as an archetypal protagonist remained a

much-beloved subject, if not target of criticism, for eighteenth-century art historians. As a separate identity from the connoisseur, the amateur was instead devoted to an intellectual formation beyond the mere possession of objects.[98]

Through the intimate reconstruction of taste as an "anthropological vehicle," Krzysztof Pomian alleges that in order to reconstruct individual taste, the choice of particular objects — evidence such as cabinets of curiosity, exhibitions, antiquarian works, *tableaus vivants*, voyage guides, and sales catalogues — is a far more accurate reflection of historical conditions than a general history of consumption might be able to offer. Patrick Michel, who also examines inventories after death and catalogues of sale in relation to the taste of connoisseurs, asserts that these documents present a stark variation on the history of taste than the sources provided by Salon criticism. Private economy, attached to discerning collectors or to the market through production, governed the creation of these collections, which fluctuated with changing market conditions that correlate to shifts in collectors' criterion of appreciation.[99] Colin Bailey asserts that the relationships between artists and their collectors indicated extreme tensions over a patron's degree of influence in making decisions on fundamental elements within a commissioned painting. In certain cases, greater design latitude was granted to the artist, allowing him to select subject matter and stylistic methods of execution.[100]

Taste, as a problematic category, may be able to account for certain dimensions of aesthetic consumption yet what it may not address are epistemological practices of collectors that fall outside the boundaries of the object. [101] But how can we assign value to an art object, and which qualities or characteristics can be considered as part of its value of exchange? In evoking a corporeality taken from elements of the visible world,

all collections operate, for Pomian, in a comparable manner – objects enact the role of intermediaries between spectators and the inhabitants of the world exterior to the collections, as a set of variable homologous relations. The utilization of language inevitably opposes what could be considered the invisible and visible, a necessity to produce objects that represent the invisible, the passage of the apparition, from the invisible to the visible, and that of its disappearance, from the visible to the invisible. Pomian identifies caverns and grottos as part of this longer tradition of objects being gaged against geological time, relative to man's interests in them as being a shorter model of chronological history.[102]

Recalling Didi-Huberman's theory of the imprint, Pomain claims that visual effects crafted by hand place the object into a perceptible relation with other discernible objects; secondly, this relation is prolonged by language, whether tacit or explicit, that establishes "an invisible rapport between the object and an invisible element." Aesthetic pleasure was connected to a dimension of uniqueness found in an object. Variations of an object or reproducible items were not singular enough for a collector's vanity.[103]

Curiosity, defined by the first edition of the *Dictionnaire de l'Academie française* (1694), connoted only outstanding qualities —the new and the extraordinary, or the most cherished paragons of an artistic genre. This quality encapsulated the passion, desire, and readiness to see, learn, and acquire rare things. Learned knowledge was not an objective, and in fact, curiosity was presumed to be a separate interest from the cultural knowledge gained by connoisseurs. Barbara Benedict, employing early modern texts as cultural documents, charts the construction of curiosity as a modern attitude teased out of curious men and women who were both consumers and "vessels of consumption." Seeing objects

firsthand denoted connoisseurship and cultural superiority, mostly in social observers. The collection as artistry marked a profound shift from being curious as an external quality to something belonging to the observer.[104] Reiterated by French curator Thierry Sarmant, curiosity was a form of sociability, not an obsessive desire to attain items of quality. "Erudite antiquity," represented by medals and civil monuments, was gradually replaced by "artistic antiquity," in the form of shells.[105] The decline in these views, or better yet, a redeployment of collectors' interests, seemed inevitable, given the renewed public interests in Roman excavation, temple ruins, and foreign sites of antique remains.

What exactly did this paradigmatic shift in collectors' interests, from medals to shells, signal about the prevailing direction of eighteenth-century art, if anything at all? Pomian, in a quantitative analysis of private collectors plausibly interested in gathering coins and medals, posits that between 1700-1720 only about thirty-nine percent of Parisian collectors were interested in these given items but they also amassed a great number of paintings, graphic drawings, and diverse curiosities. From 1720-1750, medals constituted approximately twenty-one percent of collectors' cabinets, while from 1750-1790, this proportion radically dropped to eight percent, to be replaced by a marked interest in shells and consequently, natural history.[106] This shift seems to dramatize the decrease in the number of medals in proportion to shells, which was only recorded in limited private collections.

P. Louis Joubert (1637-1719) explained the differences between ancient medals and more modern ones based upon their date of origin: " Modern medals are all those that have been made since three hundred years ago. Because of the medals that we have had since Charlemagne until the fifteenth century, the curious do not deign to pick them up,

except those which end after the Empire of the Greeks, and who could say...that they form an ugly gap between the antique and the modern..."[107] The time period between ancient medals and modern ones was perceived to be an era of unworthy collecting. Precious metals such as gold and silver, nevertheless, were always considered unique, for the rarity of their substance and their revered economic worth:

> Similarly, gold and silver were held as out of the ordinary substances, the most pure and therefore the most representative products of the earth. These are materials, noble and extraordinary, which serve to execute or decorate images, reliquaries and generally all objects used by the king: his dishes, clothes, furniture, weapons and armor, regalia, in brief, everything that represents the kingdom as an undivided whole, as the power and richness of its sovereign.[108]

Present throughout many decorative objects, these metals embodied the entirety of the French terrain which, at once, represented the metaphorical strength of its ruling monarch. Medieval medals fashioned from precious metals, for instance, were alluring, not only for their visual beauty, but also for their reliability as sources of history. Pomian suggests that these could be construed as political monuments as much as buildings, festival architecture, or paintings, bearing more "historical certitude" than engraved stones or sculpture.[109] Numismatics were necessary for the discipline of history to interrogate past centuries, to pull the light from truth, Nicolas Godonnesche proffers, and to bring "new certainty" to history.[110] Medals and coins, at length, had been considered the most unfaltering type of historical evidence, unquestionable testimony transmitted into metal that took precedence over paper despite any remote possibility of forgery.[111] Medals that depicted violence, such as those with the popular mantra "live free or die," attempted to incorporate and obliterate their references to political events. By the mid-

eighteenth century, shells would replace medals in collectors' cabinets, adopted as local evidence and as fragments of a cultural imaginary that paid homage to natural history.

**Medal as modern monument**

Founded by Jean-Baptiste Colbert in 1663, the Académie Royale des Médailles et Inscriptions, contributed to monarchical propaganda by making buildings, tapestries, medals, and tokens, revising these works for the glory of the king, and editing an official history entitled "the history of the king."[112] Medals dating around 1789 possessed diverse origins, from the wishes enacted by constitutive Assemblies, private initiatives, either French or foreign, or their related associations. In effect, the Académie Royale des Médailles et Inscriptions presided over the choice of authors, engravers, legends for the glorification of royal gestures. The atelier of the Louvre's Grande Galerie was not the only authority allowed to commission commemorative medals often to be a royal monopoly.[113] In fact, unique coins, tokens, or pieces created for pleasure could be fabricated by the designated atelier — two exemplary models of each medal in bronze, were deposed at the Galerie, with two other copies left at the Bibliothèque Nationale.

In 1763, Thomas Mangeart, a Benedictine, antiquary, librarian, and advisor to Duke Charles of Lorraine, concisely explained that a medal was, plainly stated, "a piece of metal with two faces, on each which was ordinarily printed a type and a legend."[114] The transformation of liquid metal into a formed piece of currency culminated in the merger of two dies, one bearing the engraving of the face and reverse of the coin.

> ... there is only a small issue, to cool the melted and liquified metal between these two corners, called matrices in this case. In this manner the metal fills in the void

> left by the engraver, makes an impression of this engraving, and forms a medal or coin, that he must file and round when it exits the mold. It is often very necessary to retouch, not only to polish it, but to repair the almost inevitable flaws in this kind of fabrication.[115]

In their brute state, solid metals were impenetrable materials; yet when melted and liquefied, they were transformed into malleable substances whose initial form was dictated by the hands of the artisan. Copper, bronze, pewter, iron, lead, leather, cardboard, packed earth, wood, shells, and almonds composed natural materials that served to make money, as noted by Mangeart. From Carthaginian coins made from leather to Roman items that employed ceramic earth, Greek iron coins and pieces of pewter that passed for small medals amassed by Abbé de Rothelin constituted different variations on comparable forms of fiscal currency.[116] The selling price of medals was highly dependent upon three variables noted by Thierry Sarmant: the weight of precious metal, the rarity of the medal itself, and its degree of conservation. Medals were perceived as veritable proof of history, a type of eternal certainty made permanent through imprinting onto a metal surface in the words of "*l'immortalitas in nummis*." They re-confirmed historical longevity in order to establish "a reign of truth" and sought to complete it, to see that it was corrected in the proper fashion.[117] In describing the three metals most often used in medals, silver was under the same censorship as gold but was maintained less stringently. Acknowledged as "neutral, colorless, and without great symbolic responsibility," it was a comparatively poorer metal in stature than gold or bronze. Curious collectors, for instance, liked to discover "filled" silver medals, false pieces of money fabricated during the Roman era that possessed a silver coating with a pewter interior. Pierre Jobert admitted to completing a series of silver coins with gold

ones in order to enrich the set of artifacts, illustrating the uneven relationship between the two types of metal.[118] Artful effects, such as veneered silver in coinage, enhanced the desirable character of filled medals, which were saved for their historical value.

Despite the Académie Royale des Médailles presiding over the choice of authors, and personages for engraved subjects, there was no absolute monopoly by royalty over the fabrication of coins and medals. The wishes of the Assemblies, private initiatives, French or otherwise, as well as the atelier of the Grand Galerie du Louvre were also taken into consideration. The multiplication of ateliers during the latter half of the eighteenth century explains some of the wide variety of coins available in the collections of the Département des Monnaies et Médailles of the Bibliothèque Nationale. The first register mentioned in the dépôts officiels in 1790 is a gift of the Assembly of electors of Paris in 1789 by their president M. de la Vigne.[119] As a modern monument, the commemorative medal was dependent upon qualities of material facture for its legibility as a signifier of memory and trauma. Richard Taws has argued that prints from Philibert-Louis Debucourt's *Almanach national* (1790) infused revolutionary imagery with complex temporalities involving paper, stone, and bronze. His analysis, in fact, challenges what types of media are appropriate for representing revolution and delves into the entangled relations between painting, printing, and writing.[120]

**Portrait profiles**

In transitioning to the engravers who worked during the revolution, Embossing imagery onto coins and commemorative medals required technical precision and visual acuity. Detailed execution of portraits on medals represented the body of the monarch

and the power of the state. Pierre-Simon Benjamin Duvivier (1730-1819), who succeeded his father Jean Duvivier, a medal engraver to the king in 1764, soon became the thirteenth Engraver-General of coinage in 1772. **(Fig. 2.15)** In an outillage, or steel die, depicting a profile of Marie Antoinette (1778), the details of her curled cascading ringlets, double strand of pearls adorning her neck, the lace garnishing the top of her décolletage, and the pattern of the fleur-de-lis imprinted onto the sleeves of her dress are rendered in three-dimensional depth, suggesting shape and surface roundness. We can distinguish Duvivier's last name stamped towards the bottom of the die. **(Fig. 2.16)** Louis XVI's arrival into Paris on October 6, 1798 was captured by Duvivier in another commemorative medal, where he was shown accompanied by his harried wife and son clutching a flowered hat. Promising to make Paris his permanent residence, the king was welcomed home by clamoring crowds gathered in front of the Tuileries Palace, guided by France herself in the guise of a woman wearing a crown. The curvilinear edges of the die would become smoother and more uniform over time, as engravers began to employ monetary screw press with greater force and precision to emboss coinage. Henry Nocq observes that the portraits of Louis XVI designed by Duvivier, emphasized a profile of the king that outlined "a good paragraph for the history of France." He does, however, conceal "signs of the royal face" but would allow himself to copy a "closed eye, hanging cheeks, and the inordinate neck of this insatiable eater."[121] **(Fig. 2.17)** The profiles of the queen Marie-Antoinette were, more or less, executed after her real-life personage, in comparing their likeness to some of the surviving original drawings.

Duvivier had been commissioned during the years 1781-1789 to design medals celebrating the American War of Independence, decorated with festive images of George

Washington in Boston. His forms of representation began featuring a variety of Neoclassical motifs, such as Greek-inspired drapery, Roman armory on allegorical figures, classical architectural elements as well as the Phrygian cap hung on a baton. The medal of the French nation as an indivisible republic (1793), with a set of balances carved into the plinth upon which the figure of France was seated, featured similar lettering to those of Louis XVI and Marie Antoinette **(Fig. 2.18)** For the Exposition of Industry (1798), two garbed figures proudly bear signs of the eternal importance of the useful arts, one of which holds a medical staff entwined with writhing serpents and the other an olive wreath. A Gallic rooster peers out, while on the ground, an ornamental shield, a large handled axe, a sickle, and sheaves of wheat lie scattered. The other side of the medal is outlined with garlands of leaves with tied ribbons at the top and bottom.

Duvivier's talents were noticeably recognized, for his work completed in France and abroad, but his designs were always compared to those of his father who preceded him. Pierre-Simon Benjamin's models were distinguished as being more "knowledgeable and correct" yet more conventional when comparing the two engravers' portraits. His profiles of Louis XV were idealized and even anticipated by the public:

> The portraits executed by Jean [Duvivier] never show the attenuations to which Benjamin [Duvivier] agrees sometimes...If we then examine a medal of Benjamin's representing an older Louis XV, the qualities of this strange head are there...but they are softened and tend to catch the average proportions of a classic profile. In contrast, the different planes of the chin, the cheekbones, faded cheek, are minutely detailed, shaped with admirable flexibility.[122]

Jean Duvivier's interpretations of Louis XV were perhaps more complementary in depicting him as an experienced sovereign. For both men, visual exaggeration of a

subject's facial features was a necessary technique to capture youth, social refinement, and nobility, then later, a gradual aging fused with incremental wisdom. Benjamin Duvivier relished creating several successive plans of his designs and to tweak the accessories, such as the celebrations for the birth of the Dauphin or the arrival of the king into Paris. Nocq senses, however, that there were not extremely radical differences in the appearance of their engraving styles or in their techniques. Both men utilized very small poincons in their designs.

Benjamin Duvivier's ornamental details suggested that he had kept many tools that his father had previously owned. Adapted for prodigious quantities of currency, the punches allowed him to execute rapidly many of the tiny corners on many coins.[123] In expanding our discussion to the types of currency available during the revolutionary period, three forms were prevalent. The metallic assignat, or *monnaie de confiance*, which lasted for only a limited interval, the paper assignat which proved to be a successor to billet printed by the Caisse d'Escompte, both uniform in face and color, and the metallic money formed by engravers Duvivier and Dupré with newly designated engravings of French political leaders and personalities. Nicholas Marie Gatteaux's medal featuring the Montgolfier brothers in flight (1785) and a medal illustrating the Mines d'Allemont (1783) as well as Benjamin Duvivier's portraits of Louis XVI and Marie Antoinette, and the marriage of the Duke of Bourgogne were featured. Gatteaux had participated in the first monetary concours of 1791, his son Jacques-Edouard also became a sculptor and medalist. The double Louis made from gold, for example, was characterized by certain graphic and production techniques including an inscription to Louis XVI, by the grace of God, king of France and of Navarre. Measuring a diameter of

twenty-eight millimeters, weighing approximately 15.297g with a value of 48 livres, the coin was in circulation from 1789-1792.[124]

During Louis XIV's rule, approximately 500 commemorative medals were created, accompanied by a profile of the monarch. **(Fig. 2.19)** With the successive reign of Louis XV, one hundred fifty new subjects were introduced that featured military facts, advantageous military campaigns, prestigious buildings, prizes given in the fields of painting, architecture, and medicine. Under Louis XVI, Benjamin Duvivier and Bertrand Andrieu earned success in the Americas, depicting Yorktown and the construction of the port of Charbourg.

In explaining the force of signs during the late eighteenth century, Louis Marin postulated the two-way relationship between power and representation, which duplicates the conditions that make its own reproduction possible, and the effect of the subject through modes of authorization and legitimation. The force of an image presents what is absent through its attributes of position, institution, and constitution, and by means of those effects, the image finds confirmed influence and validation. Power, as an institution of force through the French state, acted as a mandatory constraint that was legal and managed.[125] The omnipresent entity of the king through portable objects bearing his image was a "royal reality" as Marin insisted, existing as a sacramental, historical, and political body (a representational fiction through his name and the law).[126] A medal's certification of history was retained in its public usage and its greater function as part of a community; its symbolic meaning as a form of art for later generations was guaranteed by the valued metal from which it was fabricated.

> The power of a medal as money is an immediate effect of the inscription of this authority: it is this imprint which gives the piece of precious metal, medal or

> money, its authenticity and truth. Making all currencies into medals and, conversely, making medals into pieces of currency, here is a necessary political program for the glory of the prince and his memory, 'affecting all the principal things which consist in fact, in actions or in figure of which could be called in question by posterity because books could not represent them well neither their speech nor faithfully that they can be beyond any reproach.[127]

If books were not reliable for the paper they were printed upon, medals, however, transcended temporal boundaries and promised certainty imprinted onto metal discs.

> Thus the present passes as an event and becomes past history as re-presented, by every medal that generates a piece of historical time by enclosing it in print in its own memory. But this memory, because it is an indelible impression, this piece of precious metal that transubstantiated inscription in portraiture and writing joined together, is perpetuated in this durable monument to the representation and, if this memory is constant, if its material (gold, silver) and its manner (the engraving, the inscription) assures its duration, it is ever present. The event constituted as the past by its inscription is made present, but outside of time, in the immobile duration of its monument. Time as passage and as the past, made historic, raised in memory, is neutralized in the historical monument and by the same appropriate subject, identified in the presence of royal glory.[128]

Memory was made everlasting through its imprint onto a surface of precious metal, joined with a written inscription alongside a visual portrait. Guaranteed a perpetual duration of time, gold and silver composed the memory of an event long past into an eternal occurrence that stood outside the parameters of time.

**Perfecting fiscal production**

Engraver Augustin Dupré, a prominent rival of Duvivier, vehemently urged the Committee of Monies of the National Assembly to consider money as an object related to the fields of politics, finances, commerce, and art. He vigorously promoted obtaining the highest degree of perfection in fiscal production, bringing a spirit of economy by using the most efficient means against the illegal fabrication of counterfeit monies. To make the

same repetition on each letter of a legend, as well as that of poincons, it was necessary for the engraver to know how to distribute the letters and words in an "equal and symmetrical manner." The "infinity of other minute processes," to which Dupré failed to allude in crucial detail, was necessary to avoid defective currency; he briefly cited two machines that assisted the production of coins, one by Castaing that marked the sides of a coin and the other by Droz, who had contributed additions to the balancier monetaire, despite his own uncertainty about its functionality and the additional incurred expenses for its operation. Dupré had hoped that the machine could be vastly simplified in its design.[129]

The monetary screw press (*le balancier monetaire*) was initially attributed to Leonardo da Vinci, Donato Bramante, and sculptor and goldsmith Benvenuto Cellini during the early Renaissance and designed to cast a uniform coin within a rigid mold using brute force applied through a screw mechanism. **(Fig. 2.20)** As illustrated in a print taken from Denis Diderot and D'Alembert's *Encyclopédie*, this machine underwent several transformations that were documented through several generations of lithographs – a man standing in a pit dug into the ground in front of the machine was responsible for centering the flan on the surface where the design of the coin or medal would be stamped. Outstretched with two weighted arms, two other men, each gripping one arm of the machine, would walk in a circular path, turning the press down into the soft metal. Compared with the *mouton monétaire*, another type of machine used to stamp and cut coins, the screw press employed a turning motion rather than a swift, chopping gesture that wrought force onto the metal surfaces of the ingot.

A *poinçon*, united with the *outillage*, was an image in relief used to obtain a hollow imprint into a given metallic material, sinking it into a block of iron-steel that would be used to produce a coin. This process allowed for the printing of distinctive signs and images on each side of the coin. In order to fashion a basic coin, an outillage, or mold for the design of the piece typically made from iron and steel, was carved with the portrait of a famous figure, in profile, and used miniature tools set with symbols such as laurel leaves or fleur-de-lis and printed individual alphabet letters to imprint these motifs into the base of the outillage. Using pressure from a hammer or a more sophisticated means such as a balancier, the outillage was tapped onto the surface of a marker. Lavoisier's likeness placed onto a coin, after his execution by guillotine, by Aug. Duppe was not likely used as a political statement against the current regime yet was meant as a unique design that elegized his contributions as a famous savant, where the sciences and the nation wept at such a significant loss to the haphazard whims of revolutionary fury.[130] The coupoir designed by J.P. Droz (1794) during the reign of Louis XVI was a machine to cut the monetary flans was realized in this year.

The 1791 concours competition marked a significant re-evaluation of the visual aspects of currency during the French Revolution. On the advice of Jacques-Louis David and other insurgent intellectuals, Dupré directly accused the Administration of Monies and those responsible for the poor fabrication of currency in a passionate brochure that advocated for aestheticized and beautiful monies in a liberal country such as France.[131] In bolstering his critique with instances of artisans who were not licensed engravers, he identified a particular engraver who was actually a locksmith working at the Hotel des Monnaies in Bordeaux; a silversmith operating in Amiens; a clockmaker in Lille; and

lastly in Bourges, a cutlery designer. Some of these government posts, he affirmed, were dispensed as exceptional favors for hairdressers, retired gardeners, valets, and other members of the royal court.[132] Through personal invitations, engravers such as Bertrand Andrieu, Lorthior, de Rotz, Gatteaux, Bernier, as well as lesser artisans including de Huez, Château, Charpentier, Levesque, Marin, Chipart and Pouraux participated in the design competition of new medals that would properly represent the visage of the French republic.

Benjamin Duvivier offered several different variations emphasizing the king's head through a mode of true likeness. **(Fig. 2.21 and 2.22)** On the reverse side of a coin, he proposed an image of France as an upright woman holding a spear surmounted by a Phrygian bonnet in her right hand and the shield of the nation in her left.[133] In Conseil d'État from 1799, Duvivier alluded to the Roman antiquarian past by casting the modern citizen into a formal helmet with a feathered crest, or *galea*, often worn by military legionaries. Rotated in profile, the citizen as soldier carries the symbols of the Gallic coq, laurel leaves as brass trim and sloping metal chainmail carved onto the neck guard, as well as noble locks of thick hair.

Dupré himself furnished a substantial number of feasible options, namely an allegory of the nation bearing a scepter of reason, with the Constitution of the French people lying upon an altar decorated with the symbols of concord and friendship.[134] **(Fig. 2.23 and 2.24)** In another design, the conquest by liberty was depicted as another woman with an assured countenance with a mace and another Phrygian cap, with the debris of despotism scattered at her feet. An eye with protruding rays posed as a fortuitous sign of good sense and prudence; the Greek hero Hercules epitomized the force and power of the

nation and presented the tables of the constitution against the form of a pyramid, with a cornucopia leaning against an anchor indicating the surfeit of well-being and abundance. **(Fig. 2.25 and 2.26)** In portraying the French public upholding a stable neoclassical altar crowned with a sole Phrygian bonnet within fasces, which represented Paris and its sixteen districts, Dupré elicited mass approval for his numismatic designs since many of them drew upon sovereign symbols of democratic liberty and egality. Seated upon a plainly presented throne, a pharaoh woman wearing a headdress, adroitly covering her breasts, with a regal lion at her side, allows a profuse stream of water to flow from her sculpted aura, carved from the metal of the outillage. A gentleman, clinging to a bannered flagpole, is imbibing from an outstretched platter proffered by another man bearing an olive tree branch held high above him. The eternal spring of nature herself granted bountiful rejuvenation to those who were desirous of its healing powers, inferring that the French people would be given absolution to cleanse away the lingering iniquities of the past regime. A new republic could only endure with the succor of political virtue, and the Convention believed that its citizens required regeneration through a radical imitation of antiquity that would stimulate action and institutional reform.[135]

**Currency and history**

The subject of regeneration and its demotic connotations resonated throughout the revolutionary afterlife of metal. Through facets of language, money enabled the transformation of silver and gold from a market commodity into a potent symbol of economic worth and a fluid medium of exchange that traversed aesthetic and practical spheres.[136] Written inscriptions placed onto coins and medals underscored their

importance as mediators between sovereign power and public attitudes towards the governing state. Signs in late eighteenth-century France, as noted by Sophia Rosenfeld, through language and communication helped shape the political culture of the French Revolution.[137] Coinage and language have long been intertwined where textual lettering has helped to reinforce the syntactic meanings embodied by the visual images embossed into metal. Medieval French words from *monnaie*, *denier*, to *pécune*, according to Jacques le Goff, were not sufficient to enclose the broad range of semantic notions associated with money. Iniquities such as avarice were soundly condemned as a form of immoral behavior, and as an elegy to charity (benevolent giving as derived from the word *caritas*), the work of good deeds was championed as a moral solution.[138]

Modern currency, from the earlier reign of Henry II until the end of the nineteenth century, sustained several characteristics in common over time. The first name of the sovereign was followed by his number of order, which was then accompanied by the number of emission, the letter that symbolized the atelier that created the coin, the distinctive markers of the engravers and directors of the ateliers. Arranged together, the combination of a subject's name with numbers and the markers of the head engraver exemplified a syntactic approach to visual representation. Words and images worked jointly to convey the authority of the monarch in light of the nation's shifting politics. All portraits of a sovereign were typically marked by the same poinçon owned by a general engraver. John Locke in his 1698 tract on human understanding averred that gold and silver were often combined together to create ductile alloys, and as a consequence, these metals were rarely used in their purest forms.[139] Fiscal currency operated through

mediated forms, visual and physical forms that humans could appropriate, control, and comprehend.

Annales historian Marc Bloch in *Esquisse d'une histoire monétaire de l'Europe* (1954) proclaimed that money was the instrument and measure of exchanges as well as protracted transactions, upon which all economic life was predicated. The fiscal existence that concerned Bloch incorporated a mode of quotidian living. According to Bloch, three periods of history mark the changes and usage of currency over time – the first period began with the origins of European economy and the minting of gold and large amounts of currency; the second period commenced with first capitalist age leading into the first monetary regime that preceded the Industrial Revolution, marked by the predominance of metallic coinage and fiduciary money.

The eighteenth century, defined by Bloch as the "first capitalist monetary regime," heralded some of the more complex indicators of societal dynamics that historians wished to address. Bloch did not follow closely economic trends that changed between generations of time, but he did note that such transformations were dominated by two primary developments: metallic currency and the role of fiduciary and scriptural money. Gold and silver were never employed in their brute state, including ancient attempts to replicate the composition of a pure metal and proportioned ratios of various metals such as copper and tin to render more malleable alloys. Allocated by Bloch, a "value of exchange" bridged between currency's social function, its abstracted connotations, and the physical material of coinage:

> Last reminder: the intrinsic value of a currency is the content of this currency in precious metal. On the other hand, the value of exchange or purchasing power of that currency is only a notion of social and economic order. It increases when you

> can buy more goods for the same intrinsic value; it decreases in the inverse case; in other words, it increases when the prices fall and diminishes when they rise...[140]

The value conferred upon currency, with its correlated ability to purchase goods, dictated the sovereign state's reliance upon precious metals to control the cycles of prices that affected a nation's economic stability. Coinage not only fluctuated with the vicissitudes of material and form, but it also embodied the concrete standard by which goods, interest rates, and other fiduciary measures were set. Bimetallism – the system based upon silver and gold – proved to be problematic during some periods. The stability of currency in relation to a fixed quantity of precious metals could be traced back to 1726 in France, adjusted again lightly in 1785 and in England since 1717.[141] By adopting a decimal system by law on August 24, 1793, pieces of copper were minted, occasionally mixed with the metal taken from church bells, for the value of five décimes, then later for pieces of silver valued at five francs.

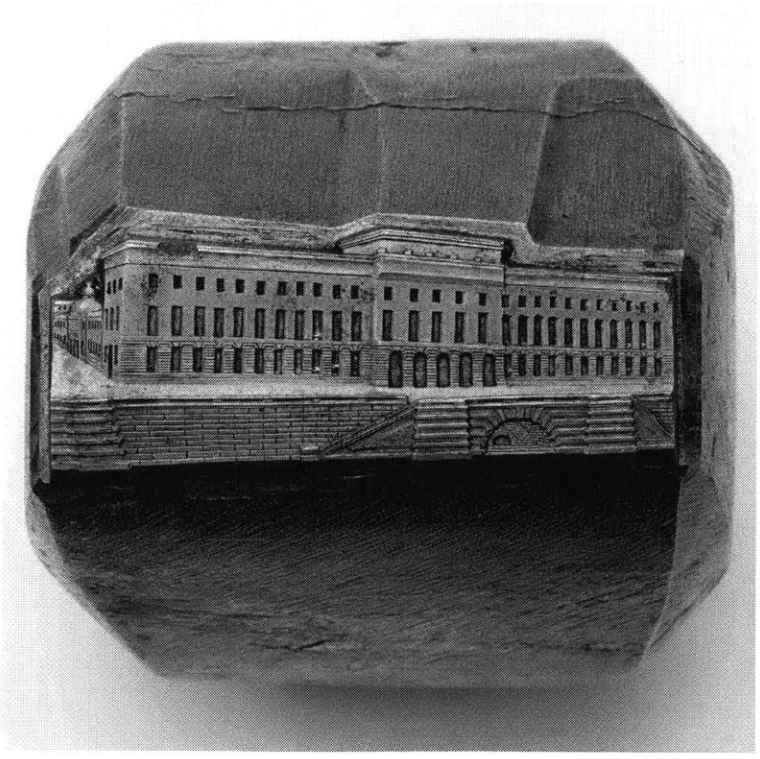
Unlike Bloch, German sociologist and philosopher Georg Simmel in *The Philosophy of Money* (1907) argued that people created "value" by making objects, separating themselves from that very same item and then attempting to overcome the critical distance between them. The growing separation between subject and object was exacerbated since objects were no longer connected with personal representatives or means of transport. Money unquestionably made all things interchangeable. For Simmel, exchange became synonymous for socialization, allowing principles of scarcity, time, sacrifice, and difficulty to determine the relative value of an object.[142] Amidst the "details and superficialities of life," the economic value of a coin or medal represented an

objectification of subjective values; in other words, what was considered an intuitive or empirical impression became subsumed under the nominal category of economy.

The Germains, Röettiers, Duvivier, and Dupré devoted themselves to reconciling technical processes with intuitive visual forms, becoming "consuming subjects" in the process. Tangible and visual attributes of coinage failed as valid representations when their value and subsequently, their ability to be identified as legitimate copies of currency was severely compromised. The greater repercussions for public policies reflected the ability of gold and silver to be defined by their relation to artificial systems of economy and social utility. Monetary objects interfered with individual freedom, invoking a "feeling of uncanniness" in the face of the sheer quantity of coins and medals that circulated during the eighteenth century.[143] Their dynamic fluidity of value led these artisans, engravers, and silversmiths to control processes of aesthetic reification as they attempted to respond to changing political regimes of violence, conversion, and rebirth.

**Illustrations**

Fig. 2.1: Jacques Röettiers, C150, 1770, Monnaie de Paris, all photos taken by Jean-Jacques Castaing



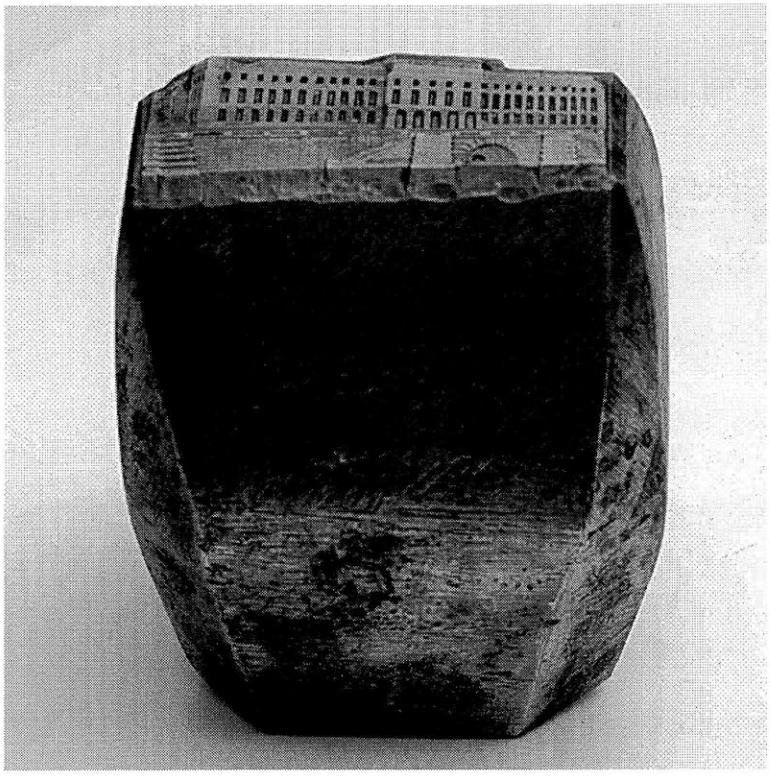


Fig. 2.2: Thomas Germain, surtout, 1730, Portugal, and Thomas Germain, surtout, 1070362, Bibliothèque nationale de France


de Thomas Germain

Fig. 2.3: François-Thomas Germain, *La machine d'argent*, J. Paul Getty Museum, Los Angeles

Fig. 2.4: Thomas Germain, soupière, printed catalogue and photograph of soupière, Bibliothèque nationale de France, Département des Estampes

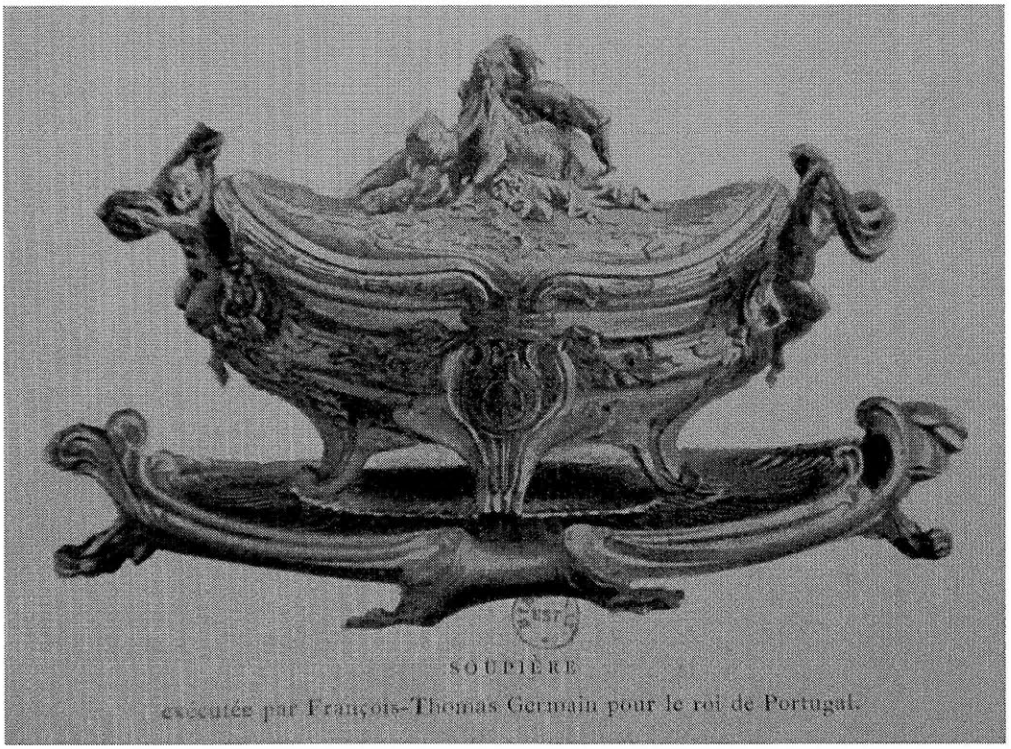


Fig. 2.5: François-Thomas Germain, aiguière and basin, 26873AB; Louis Samson II, Aiguière

Fig. 2.6: François-Thomas Germain, flambeaux, 26883, Musée des arts décoratifs

Fig. 2.7: Michel Maillard, flambeaux, 20464A, Musée des arts décoratifs

Fig. 2.8: Jacques-Nicolas Röettiers de la Tour, flambeaux, OA8250, Musée du Louvre

Fig. 2.9: Jacques Röettiers, surtout de table, OA 10631, Musée du Louvre, Paris

Fig. 2.10: Jacques-Nicolas Röettiers de la Tour, cloche, OA 10193, Musée du Louvre; Röettiers de la Tour, pot à oille, OA 8246; Joseph-Théodore Vancombert, Paris, 1777-1778, Inv. MAD 958

Fig. 2.11: Claude-Dominique Vinsac, quatre salières, drawing

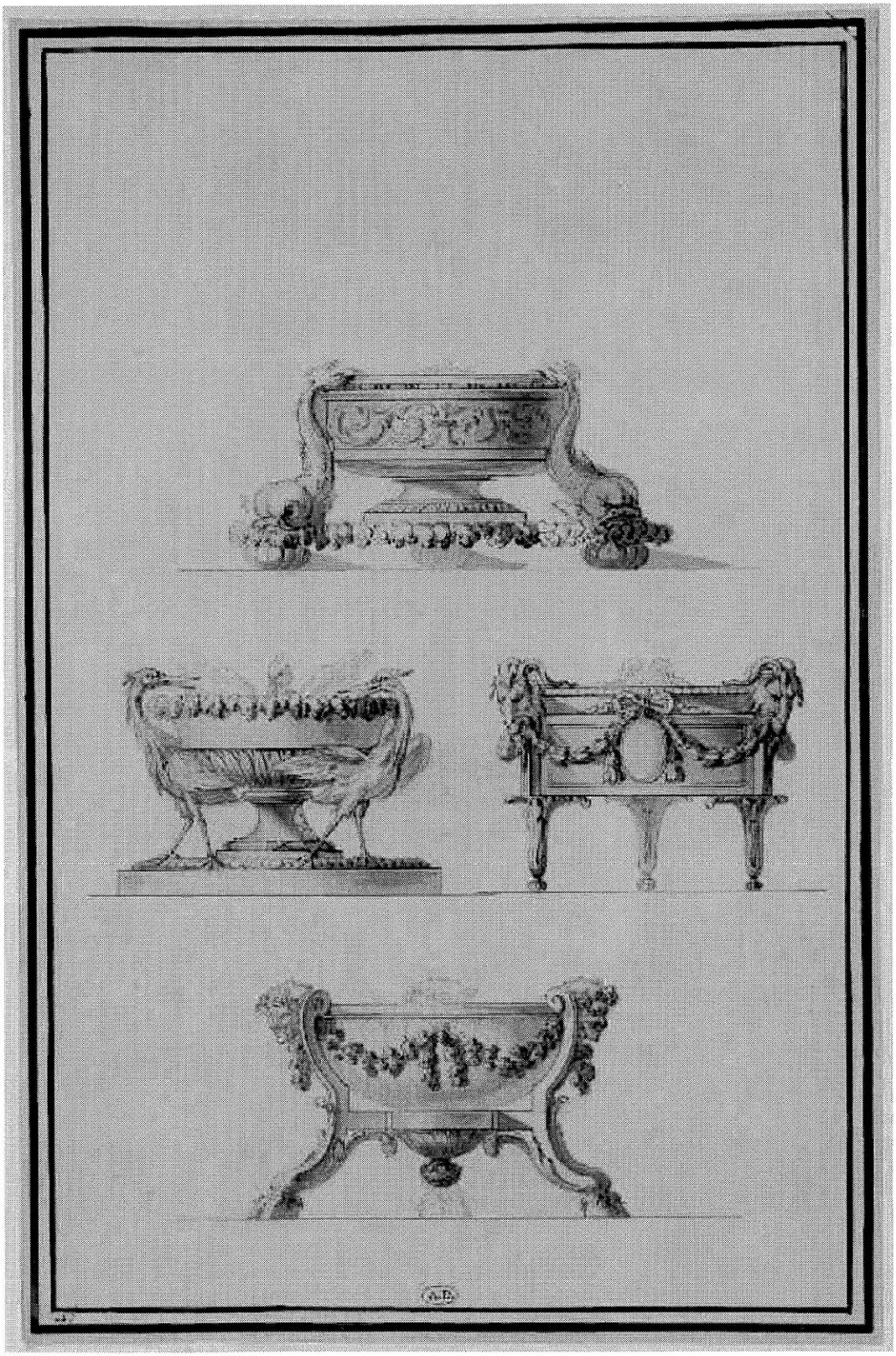


Fig. 2.12: Anonymous, traveling kit containing silver cutlery, dining and drinking vessels, 15687, Musée des arts décoratifs, Paris

Fig. 2.13: Pierre-Antoine Demachy, *The Clearing of the Louvre colonnade* (1764), Musée Carnavalet, Paris

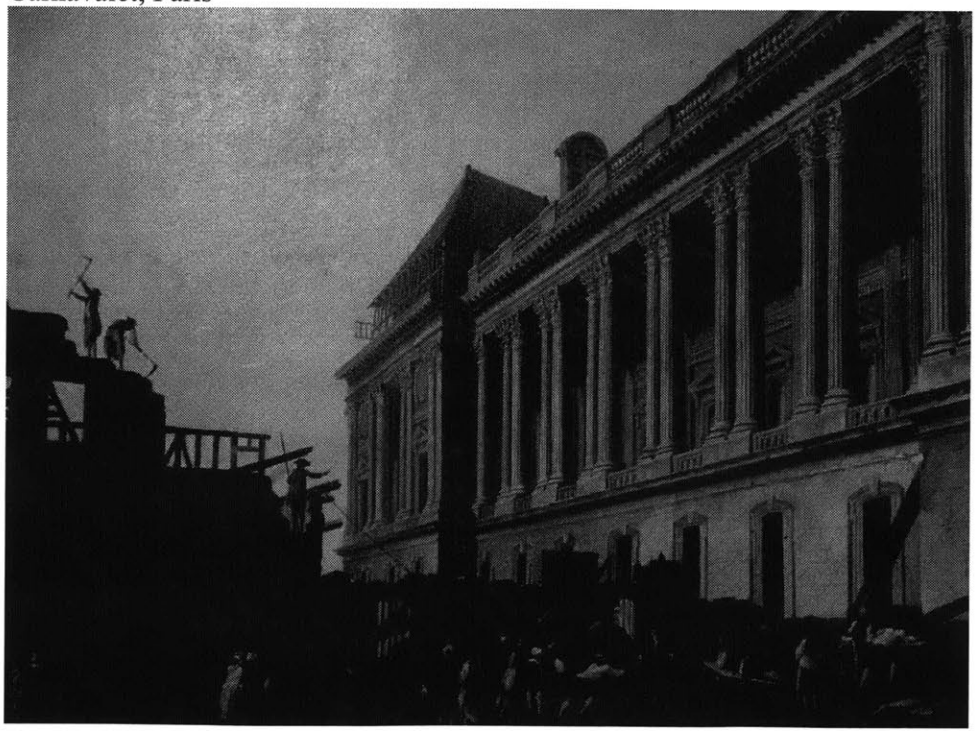


Fig. 2.14: Jean-Simeon Chardin, *Le singe antiquaire* (1726), Musée du Louvre, Paris

Fig. 2.15: Pierre-Simon Benjamin Duvivier, D13, Marie Antoinette, outillage, Monnaie de Paris


Fig. 2.16: Pierre-Simon Benjamin Duvivier, E10, Arrivée de Louis XVI, Monnaie de Paris

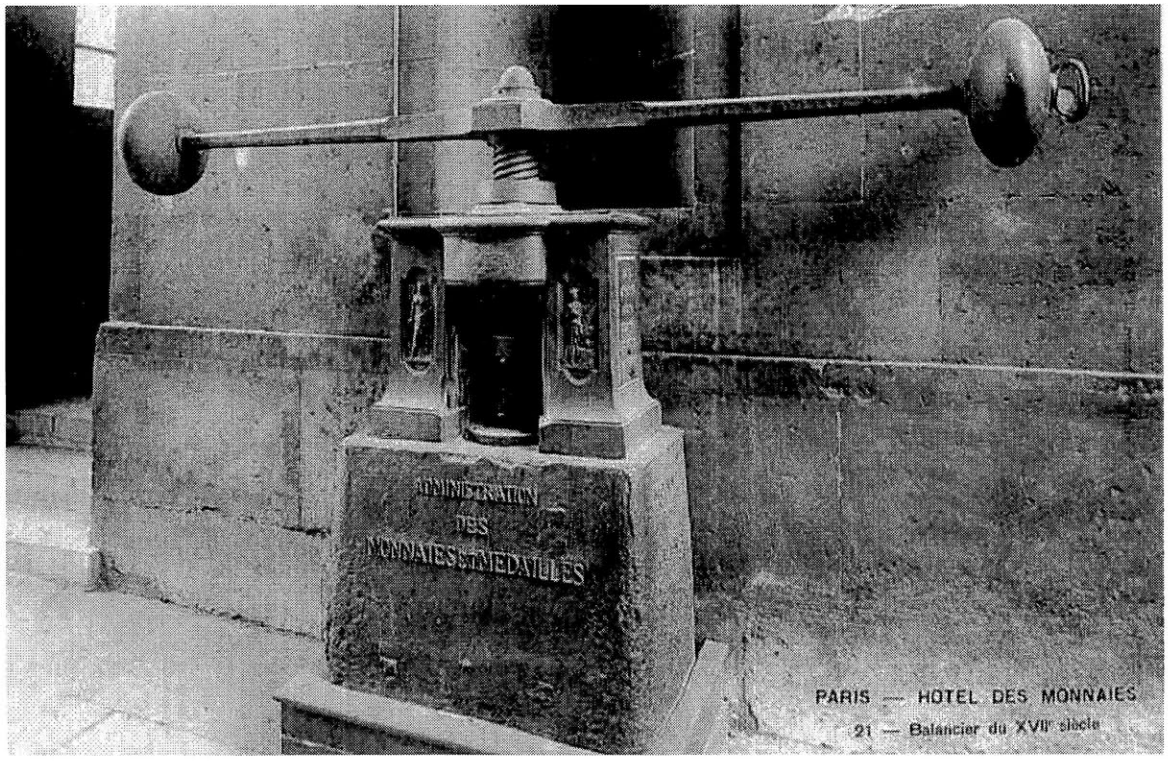
Fig. 2.17: Pierre-Simon Benjamin Duvivier, D12 Louis XVI and Marie Antoinette, Monnaie de Paris; Pierre-François Palloy, Louis XVI par la loi constitutionelle, ND 643, Musée Carnavalet

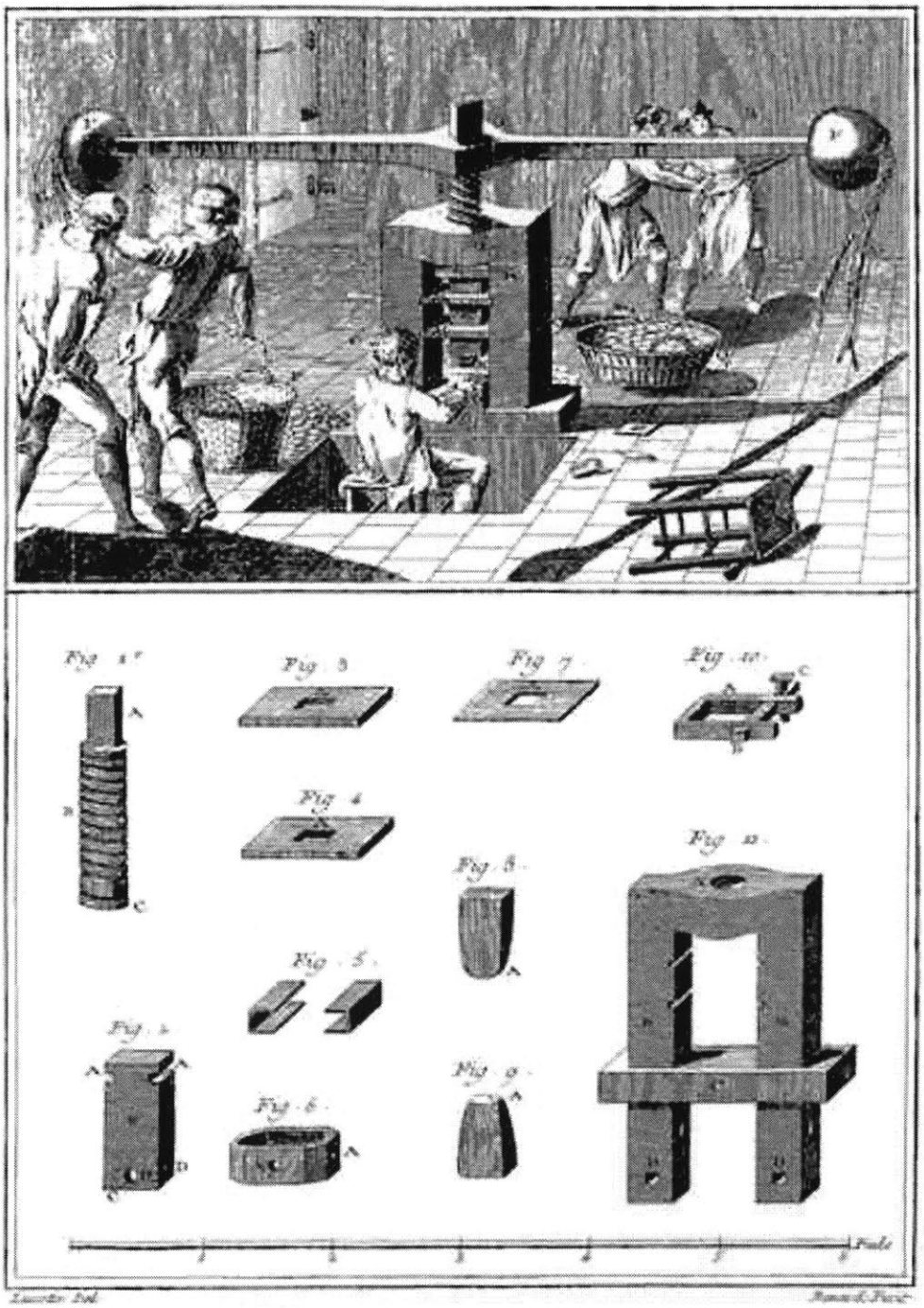
Pierre-Simon Benjamin Duvivier, E7 and E8, J. Necker, Monnaie de Paris; J.J.P.G., (Deux exemplaires d'une médaille avec le buste de Necker, in. ND 1190 and ND 1191, Musée Carnavalet)

Fig. 2.18: Pierre-Simon Benjamin Duvivier, F46, Exposition de l'Industrie, Monnaie de Paris

Fig. 2.19: Anonymous, L'Utile et l'agreable, Musée Carnavalet, Paris; Bertrand Andrieu?, Anonymous, A Laur. Lavoisier né à Paris, ND 1037 and ND 1038, Musée Carnavalet


Fig. 2.20: Postcard of a 17th century monetary screw press in front of the Hotel des Monnais and Diderot and D'Alembert, *Encylopédie*, le balancier monetaire and le coupoir à vis, Bibliothèque nationale de France






Monnoyage, Balancier.

Fig. 2.21: Pierre-Simon Benjamin Duvivier, F1, Nouvelle Ere Française, Monnaie de Paris

Fig. 2.22: Pierre-Simon Benjamin Duvivier, F64, Conseil d'Etat, 1799, Monnaie de Paris

Fig. 2.23: Auguste Dupré, REV 212, 5 francs, Hércule, Monnaie de Paris

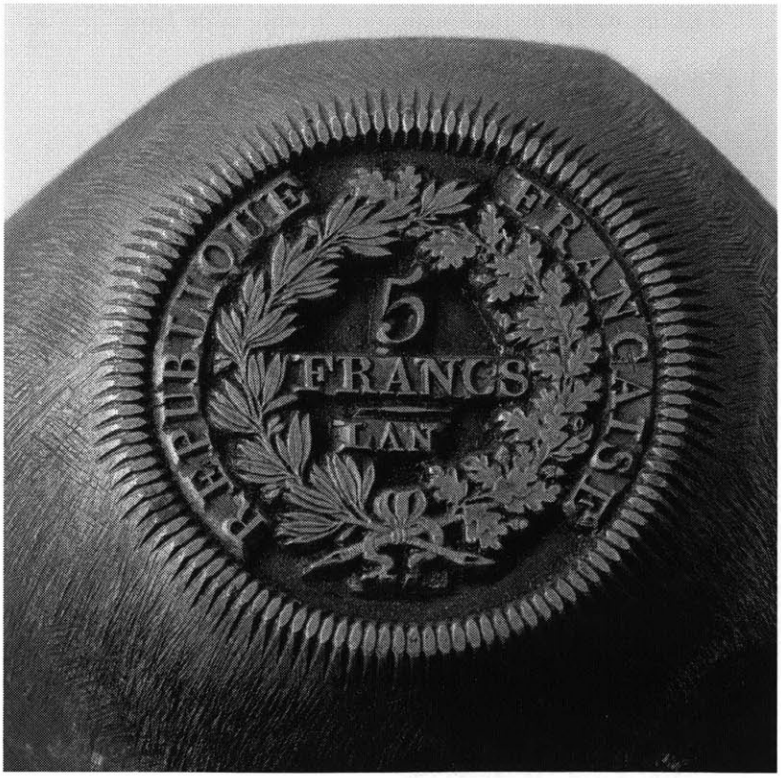



Fig. 2.24: Auguste Dupré, REV 228, 2 décimes, Liberté, Monnaie de Paris

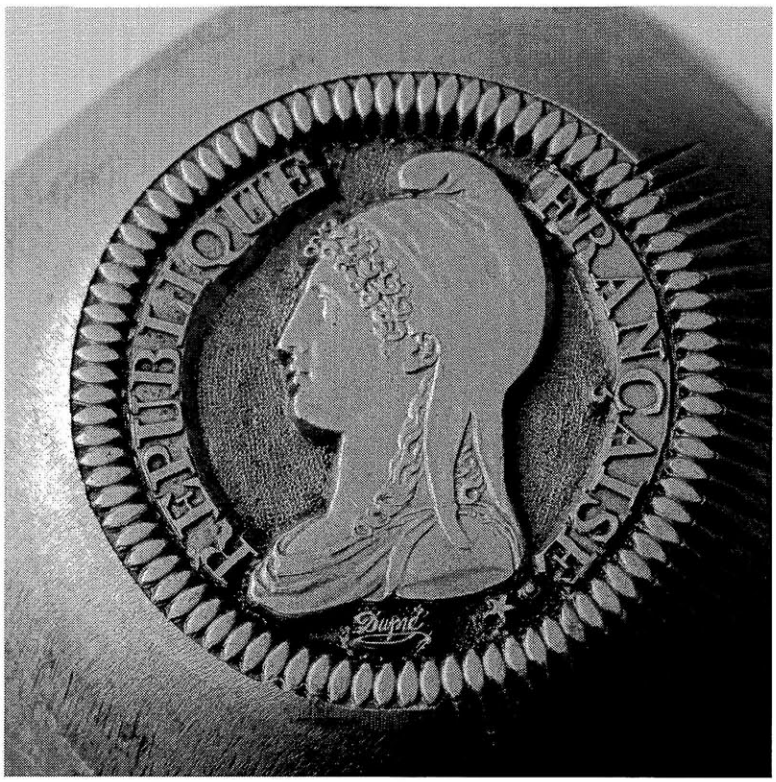



Fig. 2.25: Auguste Dupré, REV 210, décime, Arche de la Constitution, Monnaie de Paris

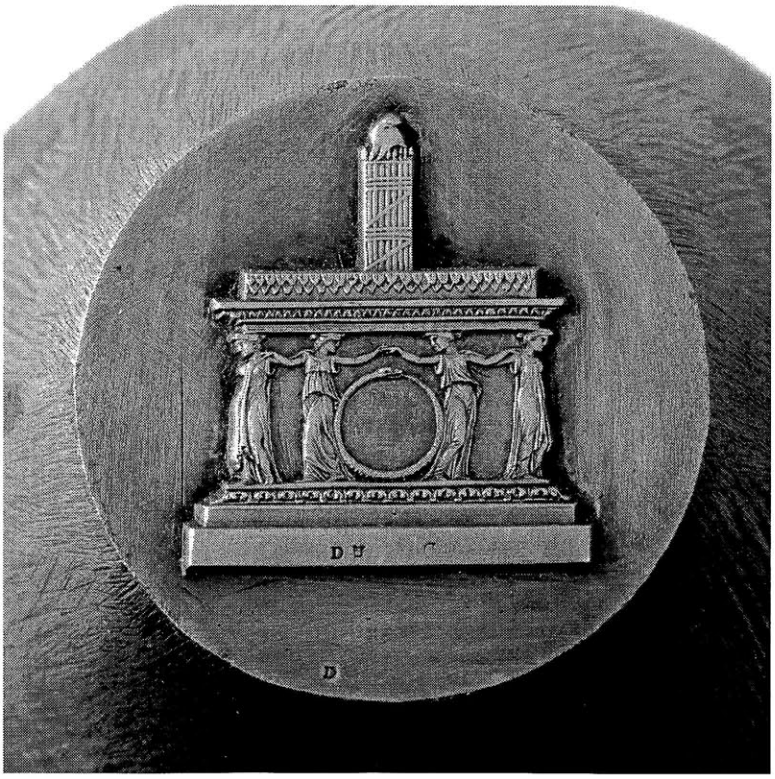


Fig. 2.26: Auguste Dupré, REV 211, 5 décimes, Régéneration française, Monnaie de Paris


Auguste Dupré, Le genie de la France, 1793, Bibliothèque nationale de France, Cabinet des Médailles, Paris

[1] The term *iconoclasm* has been systematically debated by many scholars of the early modern and modern periods published in numerous works, far too many to be mentioned here. Some notable examples include Alain Besançon, *L'image interdite: une histoire intellectuelle de l'iconoclasme* (Paris: Fayard, 1994); Stacy Boldrick and Richard Clay, eds., *Iconoclasm: Contested Objects, Contested Terms* (Burlington: Ashgate, 2007); David Freedberg, *Iconoclasts and their Motives* (Maarssen: Gary Schwartz, 1985); Dario Gamboni, *The Destruction of Art: Iconoclasm and Vandalism since the French Revolution* (New Haven: Yale University Press, 1997); Bruno Latour, *Iconoclash: Beyond the Image Wars in Science, Religion, and Art* (Cambridge: MIT Press, 2002); John Phillips, *The Reformation of Images: Destruction of Art in England, 1535-1660* (Berkeley: University of California Press, 1973).

[2] Iconoclasts have long been considered "image-breakers," but in this chapter, I treat objects as equivalent to images. Metalwork, similar to illuminated manuscripts or monumental sculpture, was destroyed for economic and religious reasons, or sometimes as medieval art historian John Phillips insists, because it was merely "in the way."

[3] Erika Naginski identifies this consuming desire for matter's animation as "a recipe for ferment inherited from materialist interpretations of absence and substance, destruction and production" in her coda "The Object of Contempt," *Sculpture and Enlightenment* (Los Angeles: Getty Research Institute, 2009): 290-291.

[4] François Hartog, *Régimes d'historicité: présentisme et expériences du temps* (Paris: Édition du Seuil, 2003). Hartog's proposition of a "historical horizon" allows us to perceive moments of temporal crisis by paying attention to the categories that organize and enable these experiences. This sense of history takes the form of a narrative where past, present, and future do not coexist as concurrent states but stand in chronological relation to one another (not as a linear whole). The distant past can thus be a model for the near future. Narratives can provide a complex understanding of historical events.

[5] Charles-Nicolas Cochin, "Supplication aux orfèvres, ciseleurs, et sculpteurs sur bois" in *Mercure de France* (December 1754): 141, 104-105. In *The Rococo Interior: Decoration and Social Spaces in Early Eighteenth-Century Paris* (New Haven: Yale University Press, 1996) Katie Scott argues that the rococo was always characterized by an absence – an absence of proportion, harmony, symmetry, balance, sense, judgment, and taste. Consult Christian Michel's *Charles-Nicolas Cochin et l'art des lumières* (1993).

[6] Marian Hobson, *The Object of Art: The Theory of Illusion in Eighteenth-Century France* (Cambridge: Cambridge University Press, 1982). See chapter 1: Illusion and the Rococo: The Idea of Papillotage, p.47-61.

[7] Scott, 263. Intimate moments in the sculptural rococo decoration of buildings such as the Wieskirche in Steingaden designed by Dominikus and Johann Baptist Zimmerman overwhelm the viewer but are never subsumed by the architecture itself.

[8] Peter Fuhring, *Designing the Décor: French Drawings from the Eighteenth Century* (Lisbon: Calouste Gulbenkian Foundation, 2005).

[9] Voltaire's poem "Les vous et les tu" refers to Thomas Germain in the last stanza.

Non, madame, tous ces tapis
Qu'a tissus la Savonnerie,
Ceux que les Persans ont ourdis,
Et toute votre orfèvrerie,
Et ces plats si chers que Germain
A gravés de sa main divine,
Et ces cabinets où Martin
A surpassé l'art de la Chine ;
Vos vases japonais et blancs,
Toutes ces fragiles merveilles ;
Ces deux lustres de diamants
Qui pendent à vos deux oreilles ;
Ces riches carcans, ces colliers,
Et cette pompe enchanteresse,
Ne valent pas un des baisers
Que tu donnais dans ta jeunesse.

[10] Claude Blair, general editor, *The History of Silver* (New York: Ballantine Books, 1987): 127.

[11] *Les Grands Orfèvres de Louis XIII à Charles X*, preface by Jacques Helft (Paris: Hachette, 1965): 103.

[12] Ibid., 132-135. Architectural interiors were also not immune to the rococo's decorative forms, which could be perceived as extending social practices that made these forms meaning for aristocratic and royal patrons. See Jean-François Bédard, *Decorative Games: Ornament, Rhetoric, and Noble Culture in the Work of Gilles-Marie Oppenord (1672-1742)* (Newark: University of Delaware Press, 2011). He argues that the *goût moderne* took on different guises from the time of Marquise de Rambouillet to the Orléans regency and expressed a continuity of *mondain* values.

[13] Colin Jones, *Paris: The Biography of a City* (New York: Penguin Books, 2006): 186.

[14] Anonymous, "orfèvrerie" in *Encyclopédie*, 11:627. Accessed January 10, 2012, http://artflx.uchicago.edu/cgibin/philologic/getobject.pl?c.10:1698.encyclopedie0311.

[15] Pierre Germain, *Elements d'Orfèvrerie* (1748), Reserve JH 49, Bibliothèque des Arts Décoratifs, Paris. See plates 15-18 of vases with handles, plate 47 of a chandelier, and plate 78 as examples of Röettiers' work.

[16] Blair, 128.

[17] Fiske Kimball, "Styles of Silver" in *The Philadelphia Museum Bulletin*, Vol. 41, No. 209 (March 1946): 67-79, 67.

[18] See Malcolm Baker, *Figured in Marble: The Making and Viewing of Eighteenth-Century Sculpture* (Los Angeles: J. Paul Getty Museum, 2000): 22 on the role of subcontractors in creating decorative ornament.

[19] Ibid., 136. On the economic and historical dimensions of English goldsmiths, see Maxine Berg and Helen Clifford, *Consumers and Luxury Consumer Culture in Europe, 1650-1850* (Manchester: Manchester University Press, 1999) and Clifford, *Silver in London: The Parker and Wakelin Partnership 1760-1776* (New Haven: Yale University Press, 2004); "Concepts of Innovation, Identity, and Imitation in the London and Provincial Metal-working Trades 1750-1800" in *Journal of Design History*, Vol. 12, No. 13 (1999), special issue Eighteenth-Century Markets and Manufactures in England and France, p.241-256; "The King's Arms and Feathers': A case study exploring the networks of manufacture operating in the London goldsmith's trade in the eighteenth century" in ed. David Mitchell, *Goldsmiths, Silversmiths, and Bankers: Innovation and the Transfer of Skill, 1550-1750* (London: Alan Sutton Publishing Ltd., 1995).

[20] Maxine Berg, "The British Product Revolution of the Eighteenth Century" in *Reconceptualizing the Industrial Revolution*, eds. Jeff Horn, Leonard N. Rosenband, and Merritt Roe Smith (Cambridge: MIT Press, 2010): 55.

[21] Mimi Hellman, "Object Lessons: French decorative art as a model for interdisciplinarity" and David van Reybrouck on the "regime of material practices that scholars deploy to accompany traditional, verbal, and pictorial rhetoric with which they distribute their theories and ideas." Making casts, selling artifacts, trading reference collections, exchanging specimens, labeling objects, displaying finds are the tricks and tropes of this non-discursive, material form of rhetoric (198).

[22] Reed Benhamou, "Imitation in the Decorative Arts of the Eighteenth Century" in *Journal of Design History*, Vol. 4, No. 1 (1991): 10, 1-13.

[23] Fregnac et Levaillois, *Les Grands Orfèvres*, 225. Additional silversmiths soon specialized in the veneering of silver including Marie-Antoine-Joseph Tugot and his son Jacques Daumy "qui ouvrirent en 1785 une manufacture de ce genre à l'hôtel de Pomponne, sis rue de la Verrerie – d'où le nom générique de "pomponne" donné à la fin du XVIIIe dans la première moitié du XIX à tous les objets de cuivre doublé d'argent ou d'or."

[24] René Ménard, *Histoire des arts décoratifs*, La *décoration au XVIII siècle: Le style Louis XVI* (Paris: L.Allison, 1892): 48.

[25] Martina Droth, ed., *Taking Shape: Finding Sculpture in the Decorative Arts* (Los Angeles: J. Paul Getty Museum, 2009).

[26] Solange Brault and Yves Bottineau, *L'orfèvrerie française du XVIIIe siècle* (Paris: Presses Universitaires de France, 1959): 27.

[27] Marco Collareta, "L'historien et la technique, sur le rôle de l'orfèvrerie dans les vies de Vasari" in *Histoire de l'histoire de l'art, Tome 1: de l'Antiquité au XVIIIe siècle*, cycles de conférences organisés au Musée du Louvre par le service cultural (10 Octobre – 14 Novembre 1991), (25 Jan – 15 Mars, 1993) (Paris: Klincksieck, 1995): 165-176. Collareta explains his version of L'orfèvrerie/dessin : "A l'origine de cela, il y a probablement le caractère spécifique des techniques d'orfèvrerie; la complexité des procédés et la variété des produits obtenus renvoient presque spontanément à un seul principe créatif, à savoir le 'dessin.' Lequel est à la base des différents arts." (166-67).

[28] Georges Didi-Huberman, *La ressemblance par contact: archéologie, anachronisme et modernité de l'empreinte* (Paris: Éditions de Minuit, 2008): 32, see 27-70.

[29] Germain Bapst, *Études sur l'orfèvrerie française au XVIIIe siècle: Les Germain: Orfèvres-Sculpteurs du Roy* (Paris: J. Rouam, 1887): 7, 104. Bapst's texts can be found at the Institut national d'histoire de l'art (INHA) such as *Le musée rétrospectif du métal à l'exposition de l'Union centrale des beaux-arts* (Paris: 1881); *L'orfèvrerie detain dans l'antiquité* (Paris: Didier, 1882); *L'orfèvrerie française à la cour de Portugal au XVIIIe siècle* (Paris: Société d'éncouragement pour la propogation des livres d'art, 1892).

[30] François-Thomas Germain, *Offres de concours à Messieurs les orfèvres de Paris* (Paris: Dufour, n.d.), Bibliothèque Nationale de France, Paris.

[31] "Casting Nature: François-Thomas Germain, Machine d'Argent" exhibition brochure, July 11, 2006 – March 25, 2007 at the J. Paul Getty Museum, Los Angeles, California.

[32] *Mémoire par les Sieurs Germain...Rondé, Röettiers, Jacqmin, tous quatre orfèvres du roi, Lagneau,... Arnault de S. Julien,... Le Riche, Magimel, Devilliers, Lempereur, Desormaux, Thierce et autres, tous anciens gardes de l'orfèvrerie-joaillerie de Paris, et les autres maîtres et marchands orfèvres de ce corps, au nombre de plus de soixante, contre les maîtres et gardes de l'orfèvrerie-joaillerie de Paris, et Adrien-Marc Baudan et Edme Dechambre, compagnons sans qualité* (Paris: J. Lamesle, 1748): 113. In her monograph *François-Thomas Germain, orfèvre des rois* (1993), Christiane Perrin

contends that there were three primary documents unknown to Bapst when he researched the lives of the Germain artisans. These papers may have been indispensable in determining their attitudes towards the production of decorative works – register of receipts addressed to the Portuguese court, located in the archives of the Ministry of Finances in Lisbon; an act of sale conserved in the archives of the Minutier central that established how Germain partnered with some financiers in 1765; and a testimonial written by Germain himself in his own defense after he claimed bankruptcy.

[33] Ibid. The charge mark in the shape of a cow's head proved that Germain had registered the piece at the tax office while the discharge mark in the form of a small cow, used from 1733 to 1775 on works intended for exportation, indicated that the necessary taxes had been paid on the silver, which was then released for sale abroad.

[34] On British slavery and the labor of sugar, consult Dian Kriz, *Slavery, Sugar, and the Culture of Refinement: Picturing the British West Indies, 1700-1840* (New Haven: Yale University Press, 2008).

[35] Jules Guiffrey, *Francois-Thomas Germain, Sculpteur et orfèvre du roi*, documents inédits, 1763-1777: 56. See also Guiffrey, *Inventaire général du mobilier de la couronne sous Louis XIV* (1663-1715) published by the Society of Encouragement for the Propagation of Books of Art in 1886.

[36] François-Thomas Germain, Olive spoon with the arms of the Rainier de Guerchy family, Paris, 1759, Inv. MAD 1012, Musée des arts décoratifs, Lyon, France.

[37] Helen S. Foote, "French Silver" in *The Bulletin of the Cleveland Museum of Art*, Vol. 27, No. 6 (June 1940), 87-90, 88.

[38] Ibid., 130. Refer also to Henri Bouchet, *Cent modèles d'orfèvrerie française des XVIIe et XVIIIe siècles executés par les orfèvres-sculpteurs royaux Nicolas de Launay et J. Jacques Röettiers* (Paris: E. Rouveyre, 1889). Previous models were copied from Meissonnier's *Livre d'Ornements*, whose etchings were engraved by Pierre-Quentin Chedel or Laureolli and published by Gabriel Huquier. Individual prints by these artists exist in folios at the Jacques Doucet collections.

[39] Helft, *Les grands orfèvres*, 142.

[40] Musée des Tissus et des Arts décoratifs de Lyon, one of a pair of sauceboats, Joseph-Théodore Vancombert, Paris, 1777-1778, Inv. MAD 958.

[41] Jean-Jacques Ehrlen, gadrooned beaker, 1764, Inv. MAD 979, Musée des Tissus et des Arts décoratifs de Lyon, Lyon, France.

[42] Faith Dennis, "A Silver-Gilt Ecuelle from Strasbourg" in *The Metropolitan Museum of Art Bulletin*, Vol. 37, No. 3 (March 1942): 72-73, 73. On Strasbourg as an

uninterrupted epicenter of luxury trades, see Hans Haug, *La ferronnerie strasbourgeoise au dix-septième et au dix-huitième siècle* (Paris: 1933).

[43] Rondot, 6.

[44] Jéremie Cotte, "Du trésor du médaillier: le marché ds monnaies antiques dans la France du débat du XVIIe siècle" in *Bibliothèque de l'école des chartres* (1996), tome 154, livraison 2: 533-564, 545. "Un contrôle plus strict du marché monétaire et le goût croissant pour les 'médailles' ont contribué, chacun de leur côté, à retirer les monnaies anciennes de la circulation et, pour le second, à leur éviter la fonte, qui était manifestement massive durant tout le Moyen Âge. Il est malheureusement difficile de quitter le domaine des impressions générales: les comptabilités des ateliers monétaires ne permettent pas de les affiner, qui ne se soucient pas de distinguer, parmi les matières premières, la plupart du temps exprimées en poids, les lingots des autres objets fondus" (546).

[45] Archives de la ville et de la communauté urbaine de Strasbourg, "Les Corporations à Strasbourg: Bourgeois et artisans avant la Révolution": 20.

[46] During the latter half of the nineteenth century, metals were also salvaged for reuse – see Alain Corbin, *Village Bells: Sound and Meaning in the Nineteenth-Century French Countryside*, translated by Martin Thom (New York: Columbia University Press, 1998).

[47] While I do not take up the significance of religious iconoclasm, there are many parallels between previous historical episodes, all of which possessed an economic impetus undergirding their reasoning. On Hegel and the symbolic in art, see Alain Besançon, *The Forbidden Image: An Intellectual History of Iconoclasm* (Chicago: University of Chicago Press, 2000) and John Phillips, *The Reformation of Images: Destruction of Art in England, 1535-1660* (Berkeley: University of California Press, 1973).

[48] *Lettres patentes du Roi, par lesquelles le Roi, en ordonnant que sa Vaisselle sera portée à l'Hôtel des Monnoies de Paris, pour y être convertie en Espèces, fixe le prix de celle qui y sera portée volontairement par les Particuliers*, données à Versailles le 26 Octobre 1759: 2.

[49] Ibid. See a copy of "Modèle de Reconnoissance" or bill of sale that detailed the Director of the Monnaie's signature for the exact amount of silverware for a fixed price according to the Lettres patentes of 26 October 1759, paid one year from the listed date.

[50] *Arrest du conseil d'État du Roi et lettres patentes sur icelui*, registrées en la Cour des Monnoies: 2, 1-3.

[51] *Evaluation et tarif du prix que le Roi veut & ordonne être payé aux Hôtels des Monnoies, des Matières, Vaisselles, & Ouvrages d'Or & d'Argent qui y seront apportées, conformément aux Lettres patentes de Sa Majesté du 26 Octobre 1759, registrées en la Cour des Monnoies le 5 Novembre suivant* (Paris: Imprimerie Royale, 1759): 1, 7.

[52] *Lettres patentes du roi, par lesquelles le Roi, en ordonnant que sa Vaisselle sera portée à l'Hôtel des Monnoies de Paris, pour y être convertie en Espèces, fixe le prix de celle qui y sera portée volontairement par les Particuliers* (Paris: Imprimerie Royale, 1759): 2-3.

[53] *Lettres patentes du roi, concernant l'Argenterie portée aux Hôtels des Monnoies, données à Versailles le 8 Février 1760* (Paris: Imprimerie Royale, 1760): 2-3.

[54] *Lettres patentes du roi, qui prorogent jusqu'au premier Mai prochain, le délai fixé par celles du 14 décembre dernier; & ordonnent que les Vaisselles & Argenteries qui seront portées aux Hôtels des Monnoies, tant par les Églises, Fabriques & Communautés ecclésiastiques, séculières & régulieres...*(Paris: Imprimerie Royale, 1760): 2.

[55] "Edit du Roi, portant suppression, à commencer du premier Janvier 1761, du droit de marque sur chaque marc de lingot, destiné à être converti en traits d'argent: des quatre Offices d'Affineurs & Départeurs d'or & d'argent, crées par Edit du mois d'Août 1757 pour la ville de Lyon..." in *Code de l'orfèvrerie, ou recueil et abrégé chronologiques des principaux Reglements concernant les Droits de Marque et de Contrôle sur les Ouvrages d'or d'argent, avec une table raisonnée des Matières, dans laquelle se trouvent quelques Reglements omis au Recueil, ou rendus nouvellement, suivi d'un Commentaire sur l'Ordonnance du mois de Juin 1680, au titre des droits de marque sur les fer, acier, & mines de fer* (Paris: Knapfer et fils, 1785): 300-303.

[56] "Arrest du conseil, et lettres patentes sur icelui, qui prescrivent à tous les Essayeurs des Hôtels des Monnoies du Royaume, une méthode uniforme pour faire les essais d'or & d'argent, March 9, 1764" in *Code de l'orfèvrerie, ou recueil et abrégé chronologiques des principaux Reglements concernant les Droits de Marque et de Contrôle sur les Ouvrages d'or d'argent, avec une table raisonnée des Matières, dans laquelle se trouvent quelques Reglements omis au Recueil, ou rendus nouvellement, suivi d'un Commentaire sur l'Ordonnance du mois de Juin 1680, au titre des droits de marque sur les fer, acier, & mines de fer* (Paris: Knapfer et fils, 1785): 307-311.

[57] "Arrest de la cour des monnoies, qui permet aux Orfèvres, Bijoutiers ou autres, & à tous Ouvriers ayant qualité, de faire, vendre ou débiter des boîtes d'argent, extérieurement revêtues d'or, d'une ou de plusieurs couleurs, & surdorées dans l'intérieur, avec charnières d'or & fermetures garnies d'or..." in *Code de l'orfèvrerie, ou recueil et abrégé chronologiques des principaux Reglements concernant les Droits de Marque et de Contrôle sur les Ouvrages d'or d'argent, avec une table raisonnée des Matières, dans laquelle se trouvent quelques Reglements omis au Recueil, ou rendus nouvellement, suivi d'un Commentaire sur l'Ordonnance du mois de Juin 1680, au titre*

*des droits de marque sur les fer, acier, & mines de fer* (Paris: Knapfer et fils, 1785): 323-326.

On eighteenth-century Parisian shops and luxury goods, see Natacha Coquery, *Tenir boutique à Paris au XVIIIe siècle, Luxe et demi-luxe* (Paris: CTHS, 2011).

[58] "Arrest du conseil, concernant les droits de sortie du Royaume sur les vaisselles d'or & d'argent, & autres ouvrages d'orfévrerie qui seront destinés pour les Colonies, May 24, 1765," in *Code de l'orfèvrerie, ou recueil et abrégé chronologiques des principaux Reglements concernant les Droits de Marque et de Contrôle sur les Ouvrages d'or d'argent, avec une table raisonnée des Matières, dans laquelle se trouvent quelques Reglements omis au Recueil, ou rendus nouvellement, suivi d'un Commentaire sur l'Ordonnance du mois de Juin 1680, au titre des droits de marque sur les fer, acier, & mines de fer* (Paris: Knapfer et fils, 1785): 316-317. See also "Arrest de la cour des monnoies, concernant les ouvrages d'or et d'argent, fabriqués en France ou venant de l'Etranger, June 19, 1765": 317-323.

[59] Ibid., 324.

[60] Pierre le Roy, Titre sixième, des devoirs des Maîtres et Marchands Orfèvres-Joailliers dans la profession de leur Art, 547.

[61] *Arrest de la Cour des Monnoies, qui ordonne l'exécution de la Déclaration du Roi du 14 décembre 1689, sous les peines y portées; En consequence, fait defenses à tous Huissiers-Priseurs, vendeurs de biens-meubles & autres, de vendre publiquement à l'encan les Argenterie & Vaisselle d'argent*...du 30 juin 1762: 2-3.

[62] August 26, 1793, no. 107, Manuscrits Coste, Bibliothèque municipale de Lyon, Lyon, France. Refer to Philippe Minard with Denis Woronoff, dir., *L'argent des campagnes: échanges, monnaie, crédit dans la France rurale d'ancien régime* (Paris: Comité pour l'histoire économique et financière de la France, 2003).

[63] François Bernier (1774-1793), *Tableau des poinçon des communautés d'orfèvres d'après les planches publiés en 1786* (Paris): 15.

[64] Jean-Marie Darnis, *La Monnaie de Paris, sa création et son histoire du Consulat et de l'Empire à la Restauration (1795-1826)* avant-propos de Patrice Cahart, (Paris: Centre d'études Napoléoniennes, 1988): 48.

[65] Mary Poovey, *Genres of the Credit Economy: Mediating Value in Eighteenth and Nineteenth-Century Britain* (Chicago: University of Chicago Press, 2008): 35.

[66] Ibid., 58.

[67] Mario Carpo, *The Alphabet and the Algorithm* (Cambridge: MIT Press, 2011): 3. Carpo asserts that there are three technical ages governed by means of hand-making, mechanical making, and digital making, all intended to produce "indexical sameness."

[68] Ibid., 16. Carpo employs the example of Leon Alberti who conceived of a deisgn for a building as the original and the building itself as the copy. For further elaboration on the allographic, see Nelson Goodman, *Languages of Art: An Approach to a Theory of Symbols*, second ed. (1976), p.122, 218-221.

[69] Jones, 212.

[70] H. Denise, *Des refontes de monnaies sous l'ancien régime*, in *Gazette numismatique française* (1906): 174-175.

[71] Dov Zerah, *La Monnaie de Paris: 12 siècles d'Histoire* (Paris: le cherche midi, 2006): 29.

[72] Jean-Marie Darnis, "Bras de fer' entre la monnaie de métal et la monnaie de papier au début de la Révolution (1789-1795), extract from the *Revue belge de Numismatique* (1991): 113-125, 123.

[73] A. Colson, *Notice sur les billets de confiance*, extraits de la RN, XVI, 1852, p.262.

[74] Auguste Dupré, *Eventail aux assignats et aux pièces de monnaies*, feuille en papier imprimé, monture en bois, rivure incrustée en os, 24.5 cm, 1795, Paris, Musée Carnavalet, Inv. EV. 226. On paper currency and representation, refer to Richard Taws, "Trompe l'Oeil and Trauma: Money and Memory after the Terror" in *Oxford Art Journal*, Vol. 30, No. 3 (2007): 353-376.

[75] Analogous to the franc, the livre was a currency unit based on the value of gold and silver. In 1701, the first paper notes were issued but did not hold value relative to silver due to overproduction. The Banque Royale was responsible for the livre, which plummeted in 1720. Under Louis XV's minister Cardinal Fleury in 1726, the value of the livre was set as 8 oz. of gold (a mark) equivalent to 740 livres, 9 sols. 8 oz. of silver was equal to 51 livres, 2 sols, 3 deniers. The conversion rate between gold and silver remained at 14.487 to 1.

Some other conversion rates included: Louis d'or (gold coin) = 24 livres, half-Louis = 12 livres, écu (silver coin) = 6 livres, ½, ¼, 1/8 écu denominations = 60, 30, 15 sols. Copper coins of 1 and 2 sols and 6 and 3 deniers (liard) existed while a coin of 1 livre was never minted.

[76] Joseph-Siffrède Duplessis, *Louis XVI en costume de sacre* (1777), Musée Carnavelet, Paris, France, Ancien fonds, inv. P. 1418, one of forty-six replicas made from an original painting shown at the Salon of 1777.

[77] Réau, 214.

[78] Louis Réau, *Histoire du Vandalisme: les monuments détruits de l'art français* (Paris: Robert Laffont, 1994): 10. Abbé Gregoire, Trois rapports à la convention sur le vandalisme (1794); André Laugier, "Monuments détruits en raison de leur histoire et des souvenirs qui s'y rattachent" dans Bulletin société des amis des monuments parisiens (1901); Gaston Brière, Les monuments de France pendant la Révolution de 1789 à 1795 (résumé publié dans le Bulletin de la Société de l'histoire de Paris, 1955).

[79] Ibid., 215.

[80] Gamboni, 35. See also Gamboni, "Instrument de la tyrannie, signe de la liberté': la fin de l'Ancien Régime en Suisse et la conservation des emblèmes politiques" in *Les iconoclasmes*, ed. Sergiusz Michalski (Strasbourg: 1992): 213-228. In *Introduction à l'histoire de l'art français*, André Chastel claims that patrimony, or the notion of historical heritage, was born from the conditions of the French Revolution (114).

[81] Richard Clay, "Violating the Sacred: Theft and 'Iconoclasm' in Late Eighteenth-Century Paris" in *Oxford Art Journal* (2003), Vol. 26, Issue 2: 1-22. In his essay "Bouchardon's statue of Louis XV; iconoclasm and the transformation of signs" (2007), Clay insists on iconoclasm as a type of "material sign transformation" which granted the statue both synchronic and diachronic polysemy for individual Parisians. Over the course of time, each actor was capable of generating competing and changed meanings of Bouchardon's object.

[82] Bottineau, 4.

[83] Réau, 475-476. R. Schletter, *Private Property: The History of an Idea* (New Brunswick: Rutgers University Press, 1951). See Ursula Vogel, "When the Earth Belonged to All: the Land Question in Eighteenth-Century Justifications of Private Property" in *Political Studies*, Vol. 36, Issue 1 (March 1988), p.102-122.

[84] Ibid., 378.

[85] Ibid., 333.

[86] *Etat des matières d'or et d'argent provenant des Eglises et des Établissemens ecclésiastiques supprimés dans le District de Clermont qui ont été ou qui restent à envoyer à l'Hôtel des Monnöies* (1791), Département de la Meuse, District de Clermont, Administrative records from the Musée de Monnaie, Paris, France.

[87] *Extrait du Registre des déliberations du 9 directoire du District de Bar, 9 March 1792* and *Etat general de matières d'or, de vermeil, d'argenterie...* 30th ventôse dernier, Administrative records from the Musée de Monnaie, Paris, France.

[88] 28 Brumaire 1793, Comité revolutionnaire, Section de l'indivisibilité, Paris, Administrative records from the Musée de Monnaie, Paris, France.

[89] *Etat détaille des matiéres d'or et d'argent ainsi que des galons en etoffes et en argent, Extraites des Dépôts de l'ancien commune unique de Lyon...,* Departement de Rhône, Recette Générale, le Citoyen Nivière (1789?), Administrative records from the Musée de Monnaie, Paris, France.

[90] Jean Starobinski, *1789, the Emblems of Reason*, translated by Barbara Bray (Charlottesville: University Press of Virginia, 1982).

[91] Steven Blakemore, "Revolution in Language: Burke's Representation of Linguistic Terror" in *Representing the French Revolution: Literature, Historiography, and Art*, ed. James A.W. Heffernan (Hanover: Dartmouth College, University Press of New England, 1992): 3-23, 20-21.

[92] Mary Ashburn Miller, *A Natural History of Revolution: Violence and Nature in the French Revolutionary Imaginary, 1789-1794* (Ithaca: Cornell University Press, 2011): 16-17. Miller examines these natural tropes in the context of the Terror years and includes some pertinent images: Barnabé Augustin de Mailly, "Congrès des rois coalisés, ou les tyrans (découronnés)" (1794) depicting lightning striking the crowns of European rulers; "Vue de la montagne élevée au champ de la Réunion" (1794) or a mountain at the center of the Festival of the Supreme Being from the Bibliothèque Nationale de France; Pierre-Michel Alix, *Le triomphe de la montagne* (1793) which integrated images of a volcano, mountain, and lightning together, with patriots dancing on nearby slopes and reptiles being struck in a swamp.

[93] Hubert Robert, *Démolition de l'eglise Saint-Jean-en-Grève*, inv. P. 1510, Musée Carnavelet, Paris, France. On Robert's images of catastrophes, economic uncertainty, and the disasterous climate of risk and financial speculation, see Nina Dubin, *Futures and Ruins: Eighteenth-Century Paris and the Art of Hubert Robert* (Los Angeles: Getty Research Institute, 2010). Refer also to Fréderique Baumgartner's dissertation at Harvard University "Transformation of the Cultural Experience: The Art of Hubert Robert during the French Revolution" (2011).

[94] Richard Wrigley, "Breaking the Code: Interpreting French Revolutionary Iconoclasm" in eds. Alison Yarrington and Kelvin Everest, *Reflections of Revolution: Images of Romanticism* (London: Routledge, 1993). Other related sources on revolutionary iconoclasm are Pierre Marot, "L'abbé Gregoire et le vandalism révolutionnaire" in *Revue de l'art*, no. 49 (1980), p.36-39; Edouard Pommier, *L'art de la liberté, Doctrines et débats de la Révolution française* (Paris: 1991); Dominique Poulot, "Revolutionary 'Vandalism' and the Birth of the Museum: The Effects of a Representation of Modern Cultural Terror" in *Art in Museums*, ed. Susan Pearce (London: 1995), p.192-214; Anthony Vidler, "Grégoire, Lenoir et les 'monuments

parlants'" in *La Carmagnole des Muses, L'homme de lettres et l'artiste dans la Révolution*, ed. Jean-Claude Bonnet (Paris: 1988), p.131-154.

[95] Jeff Horn, *The Path Not Taken: French Industrialization in the Age of Revolution, 1750-1830* (Cambridge: MIT Press, 2006): 9. Refer to chapter 2 entitled "A Brave New World of Work: The Reform of the Corporations and the Lettres-Patentes of May 1779." Horn, along with Leonard N. Rosenband and Merritt Roe Smith, eds., in *Reconceptualizing the Industrial Revolution* (Cambridge: MIT Press, 2010) reconceptualize industrialization as a global phenomenon, exploring a distinctive "national production ecology" in terms of natural resources, demographic pressures, cultural impulses, technological assets, and commercial practices. See Horn's article "Avoiding Revolution: The French Path to Industrialization" p.87-106.

[96] Jones, 249.

[97] For comparison, refer to Caspar Netscher, *Présentation d'un portrait en médallion*, 1658-1660, Museum of Fine Arts, Budapest, that depicts a gift for personal contemplation. Thierry Sarmant notes that the flowering of numismatics during 1660-1680 coincided with Jean-Baptiste Colbert's establishment of the Cabinet des Médailles in Paris.

[98] Patrick Michel in *Peinture et plaisir: les gouts picturaux des collectionneurs parisiens au XVIIIe siècle* (2010) examines aristocrats, financiers, artists, and men of letters, who developed private collections of paintings. In Charlotte Guichard's *Les amateurs d'art à Paris au XVIIIe siècle* (Seyssel: Champ Vallon, 2008), the amateur, an individual without a collection, is distinct from that of the collector, Refer to Dominique Poulot, "Entre philosophie et connoisseurship: la collection" in *L'Année Sociologique* (1989), vol. 3: 447-460 and Monica Preti-Hamard and Philippe Sénéchal, eds., *Collections et marches de l'art en France, 1789-1848* (Rennes: Presses Universitaires de Rennes-Paris, INHA, 2005).

[99] Ibid., 434-435. See Marie Veillon, "La science des Médailles antiques sous le règne de Louis XIV" in *Revue numismatique*, 6e série, Tome 152 (1997): 359-377. She emphasizes the similarities between antique medals and modern versions, which find their roots in Roman history and its visual illustrations. The substantial "proof of history" delivered by medals supplements the silence faced by historians.

[100] Colin Bailey, *Patriotic Taste: Collecting Modern Art in Pre-Revolutionary Paris* (New Haven: Yale University Press, 2002). Refer to Thomas Michael Bayer and John R. Page, *The Development of the Art Market in England: Money as Muse, 1730-1900* (London: Pickering and Chatto, 2011).

[101] More representative examples of scholarly articles on taste, consumption, and collections include Bettina Dietz, "Mobile Objects: The Space of Shells in Eighteenth-Century France" in *British Journal for the History of Science* 39 (2006): 363-382; Stacey

Sloboda, "Displaying Materials: Porcelain and Natural History in the Duchess of Portland's Museum" in *Eighteenth-Century Studies*, Vol. 43, No. 4 (2010): 455-472; on Watteau's dealer and director of the Gobelins Factory, Christophe Martin Vogtherr and Jennifer Tonkovich, *Jean de Jullienne: Collector and Connoisseur* (London: Paul Holberton Publishing, 2011).

[102] Krzysztof Pomian, *Collectionneurs, amateurs et curieux Paris, Venise: XVIe – XVIIIe siècles* (Paris: Éditions Gallimard, 1987) and "Marchands, connoisseurs, curieux à Paris au XVIIIe siècle" in *Revue de l'Art*, no. 43 (1979): 23-36. See work of André Leroi-Gourhan on Grotto de l'Hyène, Arcy-sur-Cure, Yonne, France.

[103] Ibid., 63. Refer to Jérôme Cotte, "Du trésor du médaillier: la marché des monnaies antiques dans la France du débat du XVIIe siècle" in *Bibliothèque de l'école des Chartres* (1996), tome 154, livraison 2: 533-564 and Antoine Schnapper, *Le géant, la licorne, et la tulipe*, Collections et collectionneurs dans la France du XVIIe siècle, tome I, *Histoire Naturelle* (Paris: 1988) and tome II, *Curieux du grand siècle, oeuvres d'art* (Paris: 1994).

[104] Barbara Benedict, *Curiosity: A Cultural History of Early Modern Inquiry* (Chicago: University of Chicago Press, 2001): 18, 158-159.

[105] Thierry Sarmant, *La republique des médailles, numismates et collections numismatiques à Paris du Grand Siècle au Siècle des Lumières* (Paris: Honoré Champion, 2003): 657.

[106] Pomian, "Médailles/coquilles = érudition/philosophie," 143. Refer to Daniel Rocher, *Les républicains des lettres* (Paris: 1988): Chapter X, "Les modèles économiques du mécénat," 259-262.

[107] P. Louis Joubert, *La science des médailles, pour l'instruction de ceux qui commencent à s'appliquer à la connoissance des médailles antiques et modernes* (Paris: L. Lucas, M. David, J. Ricoeur, 1692): 149. On the war between the ancients and the moderns, see Joan DeJean, *Ancient against Moderns: Culture Wars and the Making of a Fin de Siècle* (1997); Dan Edelstein, *The Enlightenment: A Genealogy* (2010); Marc Fumaroli, "Les abeilles et les araignées" in *La Querelle des Anciens et des Modernes* (2001); François Hartog, *Anciens, modernes, sauvages* (2005); Larry F. Norman, *The Shock of the Ancient* (forthcoming); Levent Yilmaz, *Le temps moderne: variations sur les anciens et les contemporains* (2004).

[108] Pomian, 34.

[109] Ibid., 153. Historical certainty was attached to the precious metals that comprised medals. Their permanence of material was interpreted as being analogous to their longevity that would surpass the test of time.

[110] Sarmant, 89. F.P. Barnard, *The Casting Counter and the Counting Board* (Clarendon Press, 1916); L. Brown, *British Historical Medals*, 1760-1960, Vol. 1 (B.A. Seaby Ltd., 1980); M. Jones, *The Art of the Medal* (British Museum Publications, 1979); M. Mitchiner, *Jetons, Medals, and Tokens*, vol. II, The Low Countries and France (B.A. Seaby Ltd., 1991).

[111] Alexander Nagel and Christopher S. Wood, *Anachronic Renaissance* (New York: Zone Books, 2010): 242. Numismatics in the eighteenth century exemplified a comparable problem of analysis demonstrated by medieval artifacts. Copies and forgeries were still necessary to reconstruct the appropriate non-linear heredity of an artifact. "Retroactive' monuments like Annius's *marmot osiriano* and the Christ medals are best understood in the context of medieval document forgery. The fabricator of charters and statutes was simply publishing a legal precedent known to be true, by oral tradition, for example, even though all original material traces and proofs had somehow gone astray" (249).

[112] Sarmant, 108. On the history of the medal, consult Roger Marx, *Les médailleurs français depuis 1789* (Paris: Société de Propagation des Livres d'Art, 1897); Jean Babelon, *La médaille et les médailleurs* (Paris: Payot, 1927) and *La médaille de France* (Paris: Larousse, 1948); Adrien Blanchet, *Médailles, Jetons, Méreaux*, vol. 3, *Manuel de Numismatique Française*, by Adrien Blanchet and A. Dieudonné (Paris: Éditions Auguste Picard, 1930).

[113] Sylvie de Turckheim-Pey, "Les médailles révolutionnaires conserves au Cabinet de la Bibliothèque Nationale" in *Les images de la révolution français*, publication de la Sorbonne (1988): 127?

[114] Thomas Mangeart, *Introduction a la science des médailles pour servir a la connoissance des dieux, de la religion, des sciences, des arts, et de tout ce qui appartient a l'histoire ancienne, avec les preuves tirées des médailles* (Paris: Chez D'Houry, 1763).

[115] Ibid., 3. Refer to M. Hennin, *Histoire numismatique de la Révolution française ou description raisonnée des médailles, monnaies et autres monuments numismatiques relatifs aux affaires de France dépuis l'ouverture des États-généraux jusqu'à l'établissent du gouvernement consulaire*, 2 vols. (Paris: J.S. Merlin, 1826).

[116] Ibid., 14.

[117] See Louis de Jaucourt in *Encyclopédie*, "Sciences des médailles," Tome 10, p.313-354 for not valuing books over medals.

[118] Sarmant, 309.

[119] Sylvie de Turckheim-Pey, "Les médailles révolutionnaires conservées au Cabinet de la Bibliothèque Nationale" in *L'image de la révolution française* (Paris: Collège de Sorbonne, 1988): 127-130, 127-8.

[120] Richard Taws, "Material Futures: Representing Revolution in P.L. Debucourt's Almanach National" in *The Art Bulletin*, Vol. 92, No. 3 (September 2010): 169-170, 169-187.

[121] Nocq, 79. In rendering Marie Antoinette's true likeness, Duvivier captured her "l'oeil bridé, le dront bossué, le nez excessif, la petite bouche fendue sans lèvres, l'absence totale de crane sous l'echafaudage de la coiffure ont été rarement indiqués avec autant de bonne foi. La médaille de la Reine de 72 mill., par exemple, bien que modelée sans malveillance, nous donne un portrait assez différent des peintures gracieuses de Mme Vigee-Lebrun."

[122] Ibid.

[123] Nocq, 80.

[124] Accessed on date at http://www.gold2louisxvi.fr/2.html.

[125] Louis Marin, *Des pouvoirs de l'image* (Paris: Éditions de Seuil, 1998): 13.

[126] Louis Marin, *Le portrait du roi* (Paris: Les Editions de Minuit, 1981).

[127] Ibid., 153-154.

[128] Ibid., 163.

[129] Gaspard Michel Le Blond, *Observations présentées au comité des monnoies de l'assemblée nationale* par M. Dupré, Graveur en Médailles (Paris: Imprimerie de C.F. Perlet, 1790): 13. Refer to Charles Blanc, *Notice sur la vie et les ouvrages d'Augustin Dupré*, graveur general de monnaies de la République: lue dans la séance trimestrielle des cinq classes de l'Institut, le 26 octobre 1870; Rosine Trogan, *Augustin Dupré, 1748-1833* (2000); Carl Zigrosser, *The Medallic Sketches of Augustin Dupré in American Collections* (Philadelphia: 1957).

[130] Musée Carnavalet, Paris, France, Lavoisier coins, ND 1037 and ND 1038. See *Les collections du Musée de la Monnaie – Acquisitions 1989-1996*, (Paris: Monnaie de Paris, 1996): 920 – Essai de Gengembre "Lavoisier," Consulat, An 8 (1799-1800), Bertrand Andrieu: bronze, 9g, 25.5mm, Registre 10: 19988.

[131] Charles Saunier, *Augustin Dupré, orfèvre, médailleur et graveur général des monnaies* (Paris: Société de propagation des livres d'art, 1894): 45. See Jean Mazard,

"Un directeur ignoré de la Monnaie de Paris, le citoyen Anfrye" in *Revue numismatique*, 6e série, Tome 6 (1964): 141-148.

[132] Dupré, 46.

[133] Saunier, 52.

[134] Ibid., 53.

[135] Harold T. Parker, *The Cult of Antiquity and the French Revolutionaries: A Study in the Development of the Revolutionary Spirit* (Chicago: University of Chicago Press, 1937): 120. In concurrence with the classical past, Mably called upon the austere manners and moral of the Spartans in *Entretiens de Phocion*. Rousseau advised for the creation of a tribunate, patterned after a Roman model, for the republican state. For more recent scholarship on French nationalism, see David A. Bell, *The Cult of the Nation in France: Inventing Nationalism, 1680-1800* (2003), Dan Edelstein, *The Terror of Natural Right: Republicanism, the Cult of Nature, and the French Revolution* (2010), Lynn Hunt, *The Family Romance of the French Revolution* (1993); John Shovlin, *The Political Economy of Virtue: Luxury, Patriotism, and the Origins of the French Revolution* (2007).

[136] On the kinship between literary and economic theory and production from Herodotus to Ruskin, see Marc Shell, *The Economy of Literature* (Baltimore: Johns Hopkins University Press, 1993).

[137] Sophia Rosenfeld, *A Revolution in Language: The Problem of Signs in Late Eighteenth-Century France* (Palo Alto: Stanford University Press, 2004).

[138] Jacques Le Goff, *Le Moyen Age et l'argent* (Paris: Éditions Perrin, 2010). See section 6 entitled "L'argent et les Etats naissants," p.83-97.

[139] John Locke, *An Essay Concerning Human Understanding*, 1698. Locke also commented on the plague of bad coins that had worsened England's financial crisis in 1691.

[140] Marc Bloch, *Esquisse d'une histoire monétaire de l'Europe* (1954): 9.

[141] Bloch, 79. "Il faut observer que cette stabilisation s'est opérée en deux étapes distinctes: il y a eu fixation des pièces de monnaie à une teneur métallique et une valeur monétaire toutes deux désormais invariables, mais sans que l'unité monétaire de base fut forcément exprimée par une pièce de monnaie déterminée...seconde étape: ce fut l'harmonisation de la pièce avec la monnaie réelle. Elle fut réalisée en France sur des principes posés déjà sous la Convention (décret du 1er août 1793) par la loi du 17 germinal an XI. Le franc, base du système monétaire, mise en rapport avec le système métrique et comme celui-ci accordé avec la numération décimale, sera représenté par une pièce réellement existante de 5 g. d'argent au titre de 9/10 de fin (par conséquent

contenant 4.5 gr d'argent pur). On sait que cette définition devait valoir officiellement jusqu'en 1928" (80).

[142] Georg Simmel, *The Philosophy of Money*, third edition, ed. David Frisby and translated by Tom Bottomore and David Frisby (New York: Routledge, 2004) [1907]). The concretion of money itself emerges through sheer numbers of objects.

[143] C. Asendorf, *Batteries of Life: On the History of Things and their Perception in Modernity* (Berkeley: University of California Press, 1993): 132-133.

## CHAPTER 3

## On Stone: Beholding Genealogy and Antiquity in the Architectural Practices of Georgian England

M. What are the Materials belonging to a building?
P. Brick, Tile, Mortar, Timber, Lead, Iron, Nails, Laths &c.[1]

- Batty Langley, *The Builder's Chest Book* (1727)

Buildings are the very reverse of rocks. They are absolutely in our power, both the species and the situation; and hence arises the excess in which they often abound.[2]

- Thomas Whately, *Observations on Modern Gardening* (1770)

Ardent gardener and self-appointed critic Batty Langley (1696-1751) tallied in his trade manual some requisite materials needed for the assembly of a building. He dispensed pragmatic advice about the desired dimensions of a brick, the differences between plain and ridge tiles, and how many linear feet of rough timber would comprise a load.[3] Palpably omitted among these exact supplies was the medium of stone. Stone, as a "mineral body, neither fusible nor malleable, formed in succession of time," mustered the enduring potency of past centuries during the age of Georgian England; it persisted within the exterior façades and columns of architectural edifices, cast into freestanding Grecian statues, portrait busts, ornamental capitals, and wall friezes.[4]

Referring to marble in particular, Langley construed it as being "extremely hard, firm, and solid, dug out from pits and quarries," able to take a beautiful polish to its surfaces.[5] He entailed that tangible materials defined the practice of architectural construction, a genre, for him, which also encompassed landscaping plans, shrubbery mazes, follies, pavilions, and pastoral villas. By this same logic, one could presume that eighteenth-century buildings were able to reveal a great deal about the less conspicuous

dimensions of materials that lay beyond their physical being. They also spoke volumes about their affiliated conventions, popular rituals, and vocational techniques. As accessible sources of building material, stones and rocks also served as critical pieces of evidence for English geologists, who probed the traceable remains of mountains and valleys in order to reconstruct the subterranean foundation of their immediate terrain. Architectural practices not only solicited congruous attitudes towards the picturesque and sublime scenery of England but also derived their many practical applications from a multitude of geological, antiquarian, and urban sources.

Regional stone was ubiquitously employed during the latter half of the eighteenth century. Even local contracts were broadly controlled by regional master builders, who would design an edifice, take charge of the construction process, and secure provisions from their own quarries to ensure the overall quality of the building. Stone specimens hailing from ancient parts of the former Roman Empire and foreign territories were collected to create historical genealogies of identity, using a combination of real facts and credulous folklore, for manor lords of regional estates and gentlemen with endowed income. Anglo-Saxon nobility employed these recovered artifacts to perform as evidence of their enlightened pedigree in relation to England's terrain. The presumed origins of these artifacts, their scenes of discovery, and affiliations to other illustrious works of art and historical personages only magnified the prominent narratives that these stones were to convey about their aspiring proprietors.

For Langley and other eighteenth-century architects, the prehistoric causes of stone prompted agitated deliberations on this object's internal composition, and hence, which materials were visually appropriate for English architectural design and its social

implications. Geological knowledge, which merged together cultural and scientific aspects of terrestrial objects, became widely associated with the myriad building styles of the Georgian period. In turning from France to neighboring England, this chapter contends that these geological conceptions, particularly genealogical and antiquarian beliefs, incorporated cultural, economic, and technological associations drawn from the limited physical properties of this rather mundane material. These dispersed perceptions of its qualities — taken from picturesque renderings of the English landscape, antiquarian ruins, construction treatises, and architectural techniques — attended to the visual and physical attributes of stone as naturally occurring features. The corporeal characteristics of stone, from its color, mass, surface texture, shape, and age, outlined a building's complete appearance, engendering a proliferation of meanings related to national, ecclesiastical, and aesthetic ends. A stone's internal configuration often dictated the order of a façade's ornamental patterning, the stacked arrangement of individual components for fences and walls, and infill material for the structural constitution of particular buildings.

Robert Adam, William Chambers, William Kent, and Horace Walpole each helped to define the Palladian, Neoclassical, and Gothic revival styles, employing stone in their built works. They appraised their own aesthetic preferences against the period's changing predilections — some fleeting, some more ingrained — towards classical antiquity, civic expression, and non-European design influences. Their individual engagement with the discipline of history was predicated upon an architect's preferred style in relation to the social movements of this period. Selected materials instigated a given aesthetic palette for construction, cultivating stones and other natural substances

into the vocabulary of eighteenth-century architectural styles as ideological elements of these aesthetic movements.

This chapter explores architectural formations that expressed the multi-faceted dimensions belonging to stone, connecting geology to the practice of architecture. Cultural representations of stone, manifested in picturesque scenery and images of industrial mining districts, attempted to document existing natural resources as part of the English landscape. In moving to the realm of the built environment, Gothic revival buildings and grottos desired to emulate the naturalistic features of stone, favoring visual semblance above substantive function. Hagley Hall (1736-1764), a castle and "deception designed and raised here by the late noble possessor," maintained its formidable, aged presence with "large and mossy stones which have seemingly tumbled from the tottering and ruinous walls," lying about the building in "utmost confusion."[6] Sanderson Miller, who designed the hall with classical themes, filled the surrounding grounds with a Temple of Theseus, the Wychbury obelisk, and four freestanding stones in Clent Hills that became collectively known as Ossian's tomb.

From family heraldries to ancient insignia, minor details were important for the Gothic revival's commitment to the past because they evinced an exhaustive mastery of historical references. Masonry techniques, for instance, shaped individual stones into window mouldings, tracery, battlements, and finials but also reiterated the graphic idioms associated with antiquarian and medieval motifs. Styles of masonry were broadly grouped into different classifications including *ashlar* (tooled with right-angled corners and thin mortar joints), *rubble* (stones of irregular sizes), and *block-in-course work* (a variation on coursed rubble with extra strength).[7] Dressed stones retained finely worked

surfaces that were hammered, furrowed, and vermiculated, and were sometimes left rough as a better bonding surface for the application of mortar.

Antiquarians, artists, and architects seized upon the physical properties of stone as prime opportunities to emulate and supersede material traits based in nature. Gothic revival practices closely followed classical descriptions and in turn, resurrected geological formations such as caverns, grottos or crumbling rubble in built form. These architectural constructions, defined by their fascination with natural-looking façades, performed as extended technologies of civilization that copied the patterning and outward appearance of stone. Man-made imitations, though economical in some instances, summoned fallacious compulsions. A few Gothic ruins, for example, illustrated stone fortifications painted onto flimsy canvas or collaged from papier mâché. Visual repetitions of stone in grottos further complicated the associations between appearance and actual substance. Such artificial attempts severed the assumed relationship between the exterior surfaces and internal composition of a building material. Unlike the sham gemstones and paste jewels discussed in the first chapter, some facsimiles of stone gained other qualities of cost-effectiveness, coloration, heat resistance, and smoothness, translating their simulated attributes into spurious tools of stylistic convenience. They transcended the formal and physical limitations imposed on mimetic representations, and in essence, matured into equal counterparts that exceeded their original models of design. Illusions wrought by such imitations culminated in the manufacture of Coade stone, a ceramic composite that became so adaptable in its applications that it began to compete with natural stone as a preferred building material.

**Picturesque origins**

Man's connection to the natural world in Georgian England, discussed by historian Keith Thomas, foregrounded the theological basis for human beings' rapport with animals and plants. It was envisioned that the landscape had been directly created for man's use, and thus everything had been given its own designated purpose. In the century following the English Reformation, theologians placed greater emphasis on the representation of the biblical Fall. There, in fact, existed little disharmony between the needs of man and lesser beings such as animals through the cultivation of agriculture, domestication of species, as well as land stewardship.[8] **(Fig. 3.1)** Francis Towne's painting of the Arveiron (1781) depicts a glacial tributary in the Swiss valley of Chamonix streaming from a series of mountainous elevations, flattened into two dimensions. The natural abundance of the landscape possessed divine origins that lay rooted within the forms of vivid scenery.

The picturesque referred not only to the wildness situated in the mountains but also to the more civilized gardens that flourished on aristocratic estates. Describing Lord Viscount Cobham's park at Stowe in Buckinghamshire, William Gilpin in 1748 expounded upon the quaint view that lay before him –

> Nothing certainly in the kind can be more beautiful or great, than that pompous Pile rising in so magnificent a manner above the Wood. The Building cannot possibly be shewn to greater Advantage: The Appearance it makes presents you with an Idea sufficiently grand; yet your Imagination cannot be persuaded but that it is in fact much grander; and that the Wood hides a great Part of what is to be seen from your Eye.[9]

Aesthetic categories — namely those of the beautiful, the picturesque, and the sublime — were claimed by Archibald Alison, David Hume, Francis Hutcheson, and Dulad Stewart

as pertinent visual tools to analyze elements of a panoramic vista. Considered to be relative to the sense of the mind that perceived it, beauty was not an absolute concept, for each mind witnessed a different type of attraction when admiring a scenic view.[10] Edmund Burke, for example, had not accepted that architectural splendor was connected with the proportions of the ideal human body and denied that there even existed an inner sense of beauty. He had even rejected the notion of mathematics as a conventional measure of wonder.

**(Fig. 3.2)** For Burke, the most terrifying or mystical qualities of nature — darkness, vastness, danger, pain, emotion, violence, noise, light, and smoke — defined the eighteenth-century sublime. Catastrophic sites of volcanoes and earthquakes, or naturalist Comte de Buffon's *locus horribilis* (lieu d'horreur), incited fright and wonder at the same time. These conflicting emotions are evinced in Joseph Wright of Derby's striking image of Mt. Vesuvius (1788) spewing ashen lava into a pink-tinged sky and even in his more tranquil view of a rocky sea cavern in Naples overlooking the ocean. **(Fig. 3.3)** Evoking panic rather than tranquility, David Roberts' watercolor *Destruction of Pompeii* presented toppled stone columns lying amidst hordes of trapped individuals fleeing from the rising red flames in the distance. Even geographic locations of natural disasters reinforced sublime notions of man's humble position in the natural order. Anthony Ashley Cooper, the earl of Shaftesbury, invoked the "genius of place," which through the human mind, elicited emotion, nurtured memory, and fostered an awareness of God. He advocated for grottos, cascades, and other dramatically charged landscape forms as a mean of stimulating mental associations with nature's mysteries.

Proceeding from uncommon or beautiful marvels, Joseph Addison in 1712 enunciated the proto-romantic pleasures of the imagination, which arose from landscape views and the survey of outward objects.[11] Etienne-Louis Boullée's sublime, architectural historian Dora Wiebenson recounts, assailed the spectator with sensation and sensory involvement. William Chambers, in contrast, recovered his adaptation of the sublime from the antique temples of Paestum. Even poets such as William Wordsworth remained attuned to contemporary debates in geology, as well as the writings of geographers such as Alexander von Humboldt, who also seemed to have absorbed James Hutton's ideas about the evolution of the earth. Wordworth's *Guide to the Lakes* (1810) endeavored to bridge the eras of picturesque tourism and imminent Victorian science of the nineteenth century.[12] Romantic observations of nature altered methods of drawn composition, which tried to account for the terrain's natural resources, interrupting the ongoing classical vocabulary present during this century.

Theological beliefs about natural terrain were eventually replaced by burgeoning interests in the earth sciences, including geography, geology, and mineralogy. Cultural and public attitudes towards the English landscape were fiercely shaped by these sciences, which, successively, not only improved the academic understanding of geological history and the theory of glaciations, as put forth by scientist Louis Agassiz (1807-1873), but also of the intimate liaison between the study of rocks and topography. Eighteenth-century conceptions of the picturesque, imagined by Gilpin, gradually became replaced by more empirical approaches to landscape, fueling concerted endeavors in natural history.

**Geological Grand Tour**

The geological imaginary prevalent in England eventually shifted away from viewing bucolic scenery towards documenting its more rational, if not empirical, aspects through measured drawings and perspectives. General land surveys for each British county, commissioned by the Board of Agriculture, labeled the widespread stone distribution for each local region. Patterns of national production and distribution were not commonplace yet since most of the stone was claimed for usage within a circumscribed area. Placing industrial sites onto country maps had been inaugurated by the mid-sixteenth century, including Joel Gascoyne's rendering of Cornwall county (1699), which tabulated structures such as windmills and watermills but not tin or copper mines.

William Stukeley, known as the father of field archaeology, in *Ground Plot of Avebury* (1724) demarcated the transitions experienced by stones and their natural terrain over a period of years. **(Fig. 3.4)** Stukeley's etching and later frontispiece for *Abury, a temple of the British Druids* (1743) depicted a Neolithic site populated with historic rocks and boulders whose dwindling numbers were due to local landowners who dragged off field stones as opportune building materials. What is more conspicuous about this image is Stukeley's system of mapping — he carefully took note of spots which had "a Stone standing," "a Stone fallen," "the place of Stone taken away" and "a cavity visible where a Stone stood," giving each sub-group a different shorthand symbol.[13] Stukeley was less concerned with the historical merits of ruins, which had been prominent on the site, and more intrigued by the changes of the land over time. Stones that remained behind were perhaps more useful as place markers than for economic use in architectural construction.

Thomas Martyn's 1748 map of the same county dedicated to Frederick, Prince of Wales, for instance, registered mines with small mounds and seams with broken parallel lines, with alchemical signs for tin, lead, and copper. Small circles symbolized coal-pits while triangles located iron and lead mines. According to Celina Fox, surveys of mines marked the boreholes, water levels, dykes, wagonways, gins and pits, the last was individually pinpointed with a dot in the middle of a circle. Some of these workings were conveyed with parallel lines, crossed to create rectangles and later formed as a network of joined parallelograms representing pillars and stalls.[14] Working as a military engineer, James Douglas (1753-1819) was inspired in *The Barrow Diggers* (1787) to portray the use of a sieve during an excavation with several onlookers assisting with the removal of artifacts. Drainage and navigation schemes were additional areas that constituted an increase of technical representations. Marshlands and bogs became a difficult obstacle in shaping the terrain since drainage schemes became counterproductive after exposed earth wasted away and eroded back into the waters from which it originated.[15] Unlike fixed resources such as stone quarries and iron mines, fluid formations like marshlands tended to change quickly over given periods of time, making it necessary to redraw the boundaries of their expansion or stagnation.

Stone resources that appeared on technical surveys were shown as topographical markers as well as repositories of industrial wealth. William Smith's first geological maps disclosed how dissimilar rock formations could be defined and traced across assorted territories.[16] Robert Hunt, the Keeper of Minerals in the Museum of Practical Geology, continued this tradition of surveying by publishing his results of the first national government assessment of building stone quarries. One particular instance where

investigative surveys proved to be advantageous was the untimely destruction of the Houses of Parliament by fire in 1835. In response, the English government immediately commissioned a national competition to redesign a new building. After much controversy, Charles Barry was accepted as the architect of record. His duties included completing an evaluation of United Kingdom principal building stone quarries to select the most suitable stone for the new buildings. Barry, along with Henri de la Beche, director of the new Geological Survey of Great Britain (GSBS), and Charles Harriot Smith, a sculptor and "stone expert," were charged with carrying out the investigation. The group visited approximately 102 quarries together; each person was required to examine each of the stones in order to reach a final selection.[17] Short-listed stones were subjected to rigorous engineering tests and chemical analysis. The ensuing Victorian era has mistakenly been perceived as the termination of these vernacular building materials. This presumption, however, was not accurate since many civic and private buildings utilized local stone in Pennine towns like Oxford and Bristol well into the early years of the twentieth century.[18]

In addition to practices of map-making, literary descriptions of these sites were published throughout the country, allowing laymen to chart their own itinerary to view these natural resources on display. Daniel Defoe's *A Tour through the Whole Island of Great Britain*, printed between 1724-1726 in multiple editions, provided complete textual descriptions of the surrounding English landscape. In 1726, Samuel and Nathaniel Buck likewise sketched panoramic prospects of cities, seaports, and capital towns in England and Wales, helping to make "industrial tourism" universally popular with amateur and aristocratic audiences.[19] For this incipient type of landscape, military surveyors from the

Ordnance Office created projecting views or designs in perspective of the properties placed in their care. English painter William Payne, who was Henry Gilder's student and Thomas Sandby's protégé, was dispatched to Plympton to draw measured plans for strengthening fortifications and tinted drawings of the surrounding scenery. **(Fig. 3.5)** He augmented precise topographical outlines with delicate color washes and pictorial framing effects. In his views of slate, stone, and marble quarries, he retained an engineer's eye for textural rock formations and the labor and machines required to work them, receiving high praise from Sir Joshua Reynolds for his renderings.

Demonstrated by Payne's and Paul Sandby's drawings, visual interests in trade sites merged with ongoing desires for natural vistas without any apparent contradictions. Elite travelers, in fact, did not plainly distinguish between objects of scientific curiosity, aesthetic beauty, and mechanical ingenuity, as concomitant terms such as the *sublime* and *picturesque* entered the cultural vocabulary of the lesser gentry. The growing fascination with geological formations by travelers and cognoscenti began to include areas known for their mining districts. Mines attracted scores of genteel visitors, inspired by the fundamental nature of mineral wealth and the curious, potentially sublime experience of venturing underground. Even refined aristocrats were prepared to don miners' rough garb and to be taken on guided tours of the Northumberland coal-pits.[20] Fervent entrepreneurs concerned with promoting the galvanizing incentives of industry wrapped their commercial processes in a more elegant guise, in order to attract coveted purchasers.

**(Fig. 3.6)** Breathtaking masses of rock, in fact, provided indispensable clues to the underlying structure of the surrounding landscape. Magnesium limestone, cast in shades of light yellow, was brought from the Aniston quarries in southern Yorkshire.[21] Dating

from the Lower Permian epoch, it was the only dolomite that was used on a relatively large scale for civic buildings, such as the Houses of Parliament. The stone ranged extensively in color from white to pale and dark yellow brown, sprinkled with a fine, evenly textured or coarsely crystalline composition.

Customary expositions of geological phenomena such as those authored by British paleontologist Gideon Algernon Mantell expounded upon limestone's spheroidal internal structure, commenting upon its veins of lime carbonate traversing across its surfaces. "These clusters of spheroids," he explained, "from the magnesian limestone near Sunderland, exhibit the principal varieties; some of them partake so much of the appearance of organic remains as to have been mistaken for fossils." Such descriptions dispensed not only a literary narrative about the internal composition of limestone, but also correlated compiled strata and details with the local place of discovery, becoming "structural" way-finders to guide a reader through the successive layers of each type of stone.[22] Mantell offered more perspectival views of limestone as the backdrop for dramatic sweeping imagery:

> In Somersetshire, Gloucestershire, Shropshire, North and South Wales, and Derbyshire, this limestone constitutes as it were an entire calcareous mass, which is interposed between the old red sandstone, or where that is wanting, between the more ancient Silurian and slate rocks below, and the sandstone and shales of the coal above. In Cumberland and Westmoreland, &c. it appears as an elevated belt, which partly surrounds the Cumbrian slate mountains, and forms, on the west, a ridge nearly three thousand feet in height. In Derbyshire the grand physical features of the country are produced by the mountain limestone, which rises into crags or peaks, and hills, presenting bold precipitous escarpments, and giving rise to the wildest and most picturesque scenery.[23]

Limestone initially becomes pronounced as a voluminous mass, wedged between red sandstone and slate rocks, transforming later into a beltway, or banding of rock, which crests into a vertical ridge; its manifold forms, however, gained picturesque qualities and geological significance as the crucial foundation for provincial land throughout England. **(Fig. 3.7)** Rock formations such as Devil's Chimney in the Gloucestershire region acted as the basis of folkloric tales for local residents. As oral stories were conveyed, it was supposedly the chimney attached to the Devil's dwelling hidden beneath the earth; the Devil, who was perturbed by the presence of Christian churches, immediately appeared on site to hurl stones at the local villagers. The stones, however, were soon turned back upon him, forcing him underground where he remained to unleash fumes of smoke from hell's dominion.

**Antiquarian ruins**

Historical monuments, analogous to rock formations such as Devil's Chimney, were viewed as natural phenomena to be classified and scrutinized for their stylistic precedence. The dissolution of monasteries in the 1530s and the English civil war from 1642-1649 instigated the imminent destruction of many relics in Great Britain. Determined not to be "strangers in their country," impassioned collectors belonging to the Society of Antiquaries of London, re-established in 1707, advocated for an anthropological approach towards ruins, which gave way to the more popular view that feelings of intuition and empathy could be plausible in experiencing a profound understanding of the past. In Francis Bacon's *De Augmentia Scientiae* (1623), antiquaries were characterized as typically "industrious persons, by an exact and scrupulous

diligence and observations, out of monuments, names, words, proverbs, traditions, private records and evidences, fragments of stories, passages of books, that concern not story...preserve and recover somewhat from the deluge of time."[24] Antiquaries, acutely consumed by the need to compile and compare objects, brandished non-literary artifacts as compelling sources of historical evidence; they focused upon newly discovered relics excavated from archaeological sites, hand-written manuscripts from lost personages, samples of geological stratigraphy, or town charters. Historian Rosemary Sweet has argued that these collectors drew upon the "language of sentiment" to open up new areas of inquiry and to gain a more immediate apprehension of the past.

As one of the members of the Society of Antiquaries, Thomas Pownall, fellow of the Royal Society and former governor of Massachusetts Bay and South Carolina, was more open to employing a philosophical method to obtain historical truth. He provocatively contended that the differences between romance novels and historical texts were rather insignificant. Romances of the eighteenth-century could convey historical truths as well as the discipline of history could. During the seventeenth century, the study of antiquities had been merely a hackneyed contribution to the understanding "manners and customs" whereas in the eighteenth century, Scottish philosophical historians elevated it from being a matter of curiosity to an issue of central importance.[25] Antiquarianism could then be comprehended as a social response to the religious and political conflicts of the day as well as the intellectual value of the study of ancient history.

Some of the objects re-discovered by the members of the Society of Antiquarians involved decorative items of jewelry, Roman headgear, and tools. **(Fig. 3.8)** Jacob

Schbebbelie's (1760-1792) drawing of an Anglo-Saxon treasure hoard from Trewhiddle, Cornwall (1788) featured a ninth-century ornamental scourge (ceremonial whip), a rare find for the early Christian era, originally unearthed by tin miners in a stream near St. Austell. Roman artifacts were as rife as earlier artworks buried in the ground. Labeled as the Ribchester helmet, a cavalry parade headdress depicted the ravages of time and oxidation of copper, which had affected its detailed facemask and diadem. Such valuable gold and silver objects were melted down for their scrap value and were rarely retained for their aesthetic qualities. **(Fig. 3.9)** Thomas Richard Underwood (1772-1835) studied a flint handaxe, discovered at a brickfield in Hoxne, Suffolk, employing watercolors to illustrate its angled surfaces and pointed tip. Flints were typically utilized as weapons of war, according to antiquarian John Frere, and fabricated by people who did not have available metals. In his report to the journal *Archaeologia*, Frere testified that the handaxe was man-made, not a "meteorite" or a "thunderbolt [s] from the gods."[26]

In contrast, the Society of the Dilettanti comparably emphasized the playful temperament of historical ruins, choosing instead to acquaint themselves with the fertility cult of Priapus and its erotic phallic works.[27] Within a local parish or county, a parallel culture of inquiry emerged, producing topographical literature such as Robert Plot's natural histories of Staffordshire and Oxfordshire (1677) and John Aubrey's collections of Wiltshire. Many of these literary tomes relied upon the circulation of a printed questionnaire given out to gentlemen residents and clergy. England as a nation could then be experienced through its geography and its history, but its monuments and antiquities could be counted and recorded like houses, crops, or customs duties.

Visual aspects of the picturesque infused incipient romanticism into medieval dwellings, arousing the nostalgic sentiments of visitors who were interested in ruins. Castles and abbeys symbolized key elements of national history in the passage of feudalism and the triumph of reformed religion over Catholicism. Yet they were summoned as antiquarian objects whose immediate context was destroyed when reconsidered as a scenic image or purloined souvenir. **(Fig. 3.10)** Valued as *memento mori*, prominent reminders of human endeavor's fragility, castles of once mighty families were now laid low as were related family fortunes. George Heriot's *Furness Abbey* and John Inigo Richards' *Corfe Castle* (1764) both portray once illustrious abodes as incomplete and collapsed ruins being examined by curious visitors. In his designs, Batty Langley applied a relaxed pictorial aesthetic to medieval buildings and reasoned that "mock ruins," to be painted on canvas or built in brick covered with plastering that imitated stone, were opportune for concealing disagreeable objects from sight.[28]

A genealogical lineage of an Englishman's relationship to his terrain helped define the social foundation for flourishing aristocratic estates. In selecting historical, mythological, or religious symbols and by adopting found artifacts near a chosen county, a manor lord could concoct a convincing story about the origins of his historical collection, and by extension, the greater history behind the land he owned. William Camden, for example, who had styled himself as a geographical/genealogical expert, brought back stones from Hadrian's Wall to prove the credentials of Robert Cotter, his one-time student, as a Huntingdonshire gentleman, where these artifacts became intertwined with his constructed landed identity.[29] These relics of ruins became invested with ideas of duration and simultaneously, of vehement disruption; the antiquity

projected into the present foretold of a future on the precipice of a historical breach of time.

**(Fig. 3.11)** Extensively surveyed by architect Inigo Jones and other leisure voyagers, Stonehenge was converted into one of the most popular monuments leftover from the ancient ages, cited as a compulsory destination in many travel sketches. One picture rendered in pencil, in taking its cue from this megalithic structure, illustrates the form of a praying Druid who, according to legend, was duly transformed into an adjoining semarhale stone for his heathen beliefs.[30] The concentric circles forming around a stone at Dundugan Fort in Ireland also became the subject of an etching produced by Thomas Wright of Durham, an architect and landscape designer.[31] Its tightly wound rings of buried stones echo the ancient patterns set by Druidic pillars. A scaled model of a passage-grave from Jersey (1787) replicates the same circular motif employing painted wood as self-supporting megaliths to represent the Neolithic site at Mont. St. Helier.

**(Fig. 3.12)** Freestanding carved stones, etched by Reverend Charles Cordiner of Banff, were artifacts intended to be sunken into the ground as markers for tombs or assembly places for local congregations who wished to hold open-air services. One of these relics, as an elegant and singular piece of antiquity, illustrated the partial horns of a ram, melding into two-dimensional representations of cattle marked with ornamental interlacing. The upper portion of the stone displays scrolled foliage wrapped around three old men within a Gothic arcade and another figure clasping a curved staff. The reverse side of an obelisk depicted Anglo-Saxon symbols freely interspersed between a Celtic cross's unfolded arms, framing crude winged seraphim, wolves coupled with a stag, and a

turban-wearing man carrying a spear. Despite the ostensible dearth of available explanations, we are, nevertheless, left with only vague assumptions about the contextual meaning of these symbols.

> But, on cleaning off the clay from the other side of the stone, the appearance of an angel, and finally of a sumptuous cross, emblazoned high with the most elaborate and splendid decorations, clearly evidenced the monument to have been carved after the better light of Christianity had regulated devotion, inspired the arts, and left these memorials though the kingdom of its early influence and sway. Although the (i) cross rising into light put an end to the Druid sacrifice, yet the farther contemplation of the sculptures on the stone was not without an ample fund of rational entertainment. Here conjecture becomes authenticated by unequivocal resemblances, that may be traced between the figures on this stone and several of a corresponding age in other countries.[32]

While these carved stones could be encountered in remote regions of England, urban sightings of stone markers were quite frequent. For example, press notices had appeared in the *Annual Register*, recording other curious stone figures such as one over the gateway of the Poor's house in Shoe Lane belonging to St. Andrew's of Holborn. It featured unmemorable scenes from the resurrection, completed before the Reformation, with the exception of an "inimitable piece of sculpture placed across the north gate of the churchyard of St. Giles in the Fields."[33]

**(Fig. 3.13)** The London Stone, proclaimed as a legendary Roman *milliary* from which ancient soldiers began their measurement of martial lanes, was a fragment of perplexing antiquity, which stood on the south wall of St. Swithin's Church, Cannon-street. After repeated changes, it was reduced to a mere shell of weathered, worm-eaten stone, still provoking the curiosity of those who passed by. Once regarded with inordinate reverence, the stone was attached to a strange superstition that the fortunes of London

were predicated upon its robust preservation (akin to the destinies of Scotland that depended upon the misshapen mass of granite let into the coronation chair at Westminster Abbey). Christopher Wren had reasonably concluded that by its generous foundation, it had once been part of a more considerable monument situated in the Roman Forum. Tessellated pavements and other extensive remains of Roman workmanship and buildings were later discovered, in the adjoining ground to the south, and upon digging for these cellars after the Great Fire of 1666, the stone extolled public zeal for its urgent conservation. Its engraving *Sic transit Gloria mundi*!, or translated as "thus passes the glory of the world" or "worldly matters are fleeting," exemplified perpetuity in the face of impending mortality and death.[34]

**Gothic edifices, natural cathedrals**

In the urban sphere, stones embodied not only markers for historical events but became integral to the practice and profession of architecture as discrete building components. Architectural historian Henry Goodhart-Rendel ascertains that the chief duties of an architect including building structure and providing shelter. Despite the primacy of these demands, these needs were sometimes subjugated to the overarching desire for aesthetic decoration. Adhering to a material's original usage was not a prevailing impulse for Gothic revival structures. Such buildings and follies enlarged the scope of architectural expression to exploit construction techniques for the purposes of unwarranted stylistic effects. The Greeks, for example, had carved their likeness into pediments where building eaves should have been; the Romanesque builders veneered their walls with two-dimensional arches and pillars. These undue devices gave way to

clever Georgian manor houses, complete with gables, buttressing, and sash windows, which bore a hybrid resemblance to cottages and contemporary castles. Visible brickwork in building walls was typically yellow in color, but most tastemakers during the Georgian period preferred red bricks to those that resembled stone. What appeared to be stone in ornament and dressings was sometimes, in retrospect, Roman cement.[35] As we will determine, the Gothic revival's devotion to stone borrowed the material's natural propensity for strength and its textural attributes for decorative hyperbole.

The Gothic revival movement was doggedly branded by the English as a "fashion, a style, a mark of nationality, and occasionally even a symbol of religion," but it never became fully identified as a method of construction. Eighteenth-century antiquaries lacked a great deal of accurate building knowledge that was possessed by their earlier medieval counterparts.[36] This fact, however, did not deter zealous amateurs such as Batty Langley from superimposing their own haphazard rules of design onto the Gothic revival style. **(Fig. 3.14)** Langley, in his *Gothic Architecture, Improved by Rules and Proportions* (1747), vigorously promoted the Gothic as an indigenous version of the rococo but adorned with Romantic associations. Rudolf Wittkower has portrayed Langley as contributing to the vulgarization of architectural theory; his mass appeal lay in promoting simplified methods of rational and mathematically centered writings on surveying or architecture that already existed throughout England. Langley would have been taken aback to be associated with the Gothic revival but during his time, the Gothic was believed to be a corrupt version of Roman architecture and thus was capable of improvement through the application of the established principles derived from Vitruvius and his followers such as Palladio. The contents of his book — designs for minor

buildings intended as ornaments in a landscape garden and for architectural details, such as doors, windows, and chimney-pieces — have been detailed by scholar Alistair Rowan as being barely influential.

Natural formations of stone persisted as ideal models of architectural design. Artificial grottoes decorated as rustic dwellings with sponge stones and rock petrifications harkened back to the Renaissance era, invoking what French gardener Jacques Boyceau de la Barauderie termed "savage dens" culled from models of Roman parterres and fountains.[37] A range of ideas relating to geology, botany, hydrology, medicine, and alchemy coalesced around the theme of the grotto, which despite its apposite moniker, was constructed as an architectonic form. Eighteenth-century grottoes as places "of experimentation and projection of scientific preoccupations, where mythic counterparts and phantasmic dreams emerged" continued this unbroken legacy of design, repeating elements that unveiled classical demi-gods, nymphs, and half-shells amidst volcanic rock.[38] Unlike elsewhere in Europe, English grottoes maintained their Italian consonance and were typically planned for the basement or first floor of a major building.

The ostensible allure of employing real stones and minerals for the interior decoration of English grottos remained fashionable with many amateur builders and collectors. Ephraim Chambers (1680-1740) in his *Cyclopaedia* (1728) defined a grotto within the context of natural history as a "large deep Cavern or Den in a Mountain or Rock."[39] Under this entry, a 1702 statement by M. Homberg speculated that marble pillars in the grotto of Antiparos (as a garden) grew through vegetative principles in a manner akin to plants. "Pillars and Orders of Architecture of Marble" at another grotto in Foligno, Italy escalated downwards, allowing visitors to assume that the metaphorical

plants were turned upside down.[40] Thomas Bushnell, seal bearer to Francis Bacon, had resolved to dig a grotto at Enstone in Oxfordshire, England to "sitt and read, or contemplate" under a décor of stalactites and shells, opposite "a Neptune, neatly cutt in wood, holding a Trident in his hand, and ayming with it at a Duck which perpetually turned round with him, and a Spaniel swimming after her..."[41] Meditative contemplation was less perceptible in the Goodwood Park grotto, measuring twelve feet square in West Sussex (1739). Designed by Sarah, the second Duchess of Richmond, and her daughters, it was garnished with thousands of shells formed into precise acanthus leaves, flowers, and geometric circles. The ground floor pavement consisted of animals' teeth, cut and polished, set into a star pattern.[42] Facets of the European rococo were leftover in more vernacular designs of Mrs. and Miss Bonnell, who decided to lacquer their own vases and encrust window openings with comparable organic materials.[43]

**(Fig. 3.15)** Barbara Jones relates that *tufa*, occasionally called *pierre antidiluvienne*, was a prominent type of rock employed in eighteenth-century grottos. Water from an underground spring that contains carbon dioxide, she explains, could act on the calcium carbonate of a stone, reaching the surface under reduced pressure and with evaporation. This chemical reaction caused the soluble bicarbonate to transform into an insoluble deposit on the limestone itself. The characteristic pock-marked bubbles of tufa thus ensued from this chemical reaction, leaving arbitrary and gaping holes in its surface[44] Mrs. Delany ornamented a grotto for the Bishop of Killala in Ireland in September 1732, while Josiah Lane created a similar folly at Fonthill (he was also responsible for those passages in Pain's Hill, Oatlands, Norbiton House at Kingston and Wardour). Ironically enough, the discernible contrast between the usage of real stones

and minerals and their placement into an artificial grotto went unnoticed for many of these eighteenth-century patrons and amateurs. The actual substances of stones, collected for their color or luster, became the essential components for creating the grotto's illusion of geological likeness.

**(Fig. 3.16)** In transitioning to visual representations of grottos, architectural designs mimicked the natural textures and veins found in marble and limestone. Quintessential figures from England's antiquarian past reappeared in William Kent's *Merlin's Cave at Richmond,* built for Queen Caroline in 1735. Kent illustrated an exposed cavern, not of stone, but a thatched cottage with the appearance of rugged tree trunks, emerging from a primitive forest.[45] Grotesque rocks reinforced by Gothic details were set into a classical framework. In plate 33 from John Vardy's *Some Designs of Mr. Inigo Jones and Mr. William Kent* (1744), the interior elevation of the Queen's Hermitage unfolds lengthwise, marking a tented entrance with a bookcase stuffed with portrait busts inside (one of Robert Boyle replaced with a sunburst). Six wax figures, whose identities are somewhat disputed, were supposed to embody Merlin and his secretary, Queen Elizabeth and her nurse, the queen of Henry VII, and Minerva.[46] Analogous to architect Jean-Jacques Lequeu's version of an interior apartment with a grotto secreted underneath a private staircase, Kent's upper vaulting is depicted as flattened stone stalactites pressed against the back wall. These patterns inspired by nature made their way into Georgian interiors as sculptural décor or as two-dimensional design templates.[47]

**(Fig. 3.17)** Alexander Pope's grotto (1720-1743) was one of the few designs that had been extensively verified through printed sources and first person testimonials. His

geological vision was a modest contribution to an ostentatious scheme that included the Twickenham house, an underground passage, a road from Hampton Court to London, a shell temple, a vineyard, an obelisk, a bowling green, an orangery, and a kitchen garden.[48] Inscribed with Horace's words "a secluded journey along the pathway of life," his grotto doubled as a secluded *nymphaeum*, a haunt where the poetic muses communicated with him. Layered into physical strata of varying tiers, the grotto imitated the configuration of an old mine run; yet it possessed a whimsical disposition, crowded with glittering, if not scintillating, surfaces. After a visit to the Hotswell Spa in the Avon Gorge at Bristol in 1739, Pope, inspired by his friend Ralph Allen who was building his own mansion at Prior Park located near the quarries at Combe Down, rekindled his fervid interests in mining and geology.[49] He employed a full-time professional geologist named Reverend William Borlase of Cornwall to assist in locating specimens of alabaster, colored crystals, marble, ores, and stalactites. Semi-precious stones, German spar, and English pebbles, were thrown haphazardly together — some marked with holes inside them and others filled with honeycombs — with petrified wood, green moss, and Italian marble.

Let us briefly consider Pope's own vibrant words on his grotto's appearance, followed by a selection taken from John Serle's depiction of its cavernous interior:

> **Verses on a grotto by the River Thames, at Twickenham, composed of Marbles, Spars, and Minerals (1743).**
>
> Thou who shalt stop, where Thames' translucent Wave;
> Shines a broad Mirrour thro' the shadowy Cave;
> Where lingering Drops from Mineral Roofs distill,
> And pointed Crystals break the sparkling Rill,
> Unpolish'd Gemms no Ray on Pride bestow,

And latent Metals innocently glow:
Approach. Great Nature studiously behold!
And eye the Mine without a Wish for Gold.
Approach. But aweful! Lo th'Aegerian Grott,
Where, nobly-pensive, St. John fate and thought;
Where British Sighs from dying Wyndham stole,
And the bright Flame was shot thro' Marchmont's Soul.
Let such, such only, tread this sacred Floor,
Who dare to love their Country, and be poor.

**John Serle, A Plan of Mr. Pope's Garden (1745)**

Many thick Incrustations of shot Spar of a Yellowish Cast, sprinkled with small Cubes of Mundic, Lead Ore, Kallan, or Wild Iron. Many fine Pieces of Yellow Mundic, several small Cornish Diamonds tinged with a blackish Water, and other with a green Water. Several large Groups of Cornish Diamonds, very transparent, from the Rev. Dr. William Borlace of Ludgvan in Cornwall. Many fine large Pieces of Red Spar out of Colonel Stapleton's Lead-Mine, from George Littleton, Esq; Fine Petrifactions from Gilbert West, Esq; at West Wickham in Kent; fine Incrustations from Mr. Allen's Quarries; and several Pieces of sparry Marble of different Colours from Plymouth; with many large Cornish Diamonds and other Petrifactions, which form two fine Rocks with Water distilling from them.[50]

For Pope, reflections — those impelled by translucent shining water, unpolished gems, and glowing metals — are significant mechanisms of his narrative that shape fleeting notions into physical space. They extend the impression of glinting specks of light immersed within such an obscure cavern. Serle's depiction is far more sobering, and in fact, only lists the grotto's precious minerals in a lengthy sequence. The grotto itself was the only remaining material record of Pope's life, leftover in the cellars of his villa. With a roof of pendulous spar and marble sides, two of the grotto's largest pillars hid a deep recess of stone where discrete looking-glasses reflected the waters of the Thames river. Fixated upon creating natural surfaces, Pope "had 'stellifyed' the roof with small and large Cornish diamonds from Borlase," as Serle commented, "some transparent, some of a green or blackish tinge, with large pieces of red spar to 'vastly vary the colouring." A

petite well, ornamented with stalactites with spar and quartz on its outer rim, possessed a drip of water from pipes hanging above in the icicles. Water was made to stream along the walls, falling away into discrete receptacles.[51] Pope himself noted that "As I procure more Ores and Spars, I go on enriching the Crannies and Interstices, which, as my Marbles are in large pieces, cramp'd fast with iron to the walls, are pretty spacious and unequal, admitting Loads and Veins of 2, 3, or 4 inches broad..."[52] Countless specimens of copper were intermingled with mundic, Plymouth marble, and snakestone to create a phantasmagoric collage of textural calamity, recalling the brute states of matter within the earth's core.

The reconstruction of artificial Gothic vestiges, deemed by Robert Aubin as geological "ruins of nature," was formulated in conjunction with grottoes through the "medium of geological theory." He adduces that the picturesque, chinoiserie, antiquarianism, and ruins became dominant influences upon the visual appearance of grottoes, but more importantly, the Gothic revival style remained an undervalued factor in their assembly. Grottos as "gelid caverns," "cool retreats," and "Paphian groves" relied upon the placement of tangible minerals and precious stones in order to fabricate their lavish interiors. Owing "less to Nature more to Cost," these geological ruins evoked the charming semblance of idealized caverns, rocks, and mountains, cajoling visitors with their abstruse approbation of material pastiche.[53]

**(Fig. 3.18)** Thomas Collins Overton's models of grottos direct us towards another aspect of the geological imaginary that was articulated throughout these visual representations. Overton had plagiarized Langley's work in 1766 by publishing a comparable series of designs for temples and garden follies that exaggerated the textural

and visual effects of stone.[54] In a reproduction of a "Gothic grotto," the stone façade of a house is punctuated by oval openings, enveloped with a latticework of strung pebbles coursing in diagonal lines. Measuring only ten feet square in the main entrance room, the grotto resembles a forgotten hut in the forest, decorated with fanciful features such as a rock-encrusted ocular window and shingled banding. **(Fig. 3.19)** An elaborate variation of a naturalized cathedral appears carved from masses of brute rock, broken into segmented arches with niches that hold full-length statues. Between the detached wings of the grotto, two fountains, which convert into flowing streams, are situated against rusticated stone; small spires that resemble stalactites extend along the simple roofline, culminating in a gazebo with a bell steeple.

**(Fig. 3.20)** Overton's next plate of a "Rustic grotto" employs analogous visual devices – the entire structure is sculpted from natural rock, left with a purposeful unfinished overlay. The niches for the statues, such as one of Neptune, are further set back into the depths of the building. What remains extremely incongruous is the awkward cupola, which swathes the grotto, bearing stone-encrusted openings around its striated perimeter. The exaggerated line quality of the facade brings forth the natural textures found in rocks, but as a result, the visual patterning appears inflated and jagged, converting these grottos into graphic travesties, which relied heavily upon superficial references. Somewhere between a sketch and an image for a pavilion, the grotto unfolds as a design template and less as a full-fledged architectural building. Stone's tangible dimensions — roughness, weight, and density — are reified into aesthetic disarray, stripping any aspects of physicality from the material's corporeal identity.

Chinese gardens, affirmed by William Chambers, belied an analogous Gothic sensibility retained by grottos. In his *Dissertation on Oriental Gardening* (1772), he wrote in every garden, "every walk leads to some delightful object" from orange groves, myrtle trees, and rivulets of flowing water. Grottoes within Asian parks sometimes introduced large artificial rocks, created from "a particular fine coloured stone, fired on the sea-coasts of China, and designed with much taste," usually positioned by a lake. Many of the stones were punctuated with rugged openings, exploited as caverns for "the reception of crocodiles, enormous water-serpents, and other monsters: cages for rare aquatic birds; and grottos, with many shining apartments, adorned with marine productions, and gems of various sorts." They were mounted strategically upon patches of grass, shrubs, moss, ivy, and ferns, sometimes posed with trees rooted into their crevices.[55] Chambers' botanic gardens at Kew, inspired by his travels in China, centered upon a ten-story pagoda among twenty-five other buildings including a mosque, Palladian bridge, a menagerie, an orangery, the Ruined Arch, the Temple of Bellona, and the Temple of Aeolus.

Landscaped gardens and other constructions associated with Gothic revival architecture were sometimes performed as theoretical exercises in the art of imitation. The Gothic style, according to geologist and chemist Sir James Hall, could be expanded to include most built forms, which he inferred to be universal in character. Hall traveled through western France in 1785 and noticed native peasants collecting thin poles or rods, the product of coppice woodland, which were then fabricated into wickerwork. To demonstrate his ambiguous findings, he created a miniature wicker cathedral in his garden to prove that such as material could be suitable for lesser buildings. In a paper

read before the Royal Society of Edinburgh, Hall specified several decorative elements — crockets that come from sprouting buds on willow poles and cusped ornaments replicated in "stone curling flakes of bark" — linked to visual forms discovered in nature. His theory of Gothic origins began with a sacred *ur*-church in England made from twisted rods allegedly designed by Joseph of Arimathea.[56] The peculiar forms inherent within "willow fabrics" were often copied onto the surfaces of stones; wicker, in a comparable fashion, embodied a polymorphic material that could shape individual architectural elements but transmute building appearances as a whole. Gothic churches, with their piers, ribs, and tracery, evoked primal forests in which singular trees became architectural columns, according to architect Jean-François Félibien and William Stukeley.[57] Hall himself notes that "every object which recalls that primitive state, and every memorial of what was then suffered" was often repeated and regarded with much enthusiasm.[58] Trees and Gothic columns invoked archaic origins that were brought into the practice of architecture through the act of imprinting and imitation. The physical structure of a sapling became synonymous with the Gothic revival's penchant for height, pointed arches, and medieval craftsmanship.

**Extractions and contrivances**

In moving away from metaphorical acts of imitation, the pragmatic conditions surrounding the acquisition of building materials demanded intense physical labor. The act of procuring stone from the earth was a significant practice unto itself. Names of particular quarries, comparable to titles of land, were passed down throughout centuries for trade purposes, long after the original quarry, which had established the reputation of

a stone, had ceased to exist. A more recent quarry may have yielded better material than an older one, but often an architect, who ventured to specify a stone with only a familiar local name, ran a considerable risk of being supplied with something that differed materially from his own conception.[59] Most stone and slate found in Great Britain was laid down by sedimentary deposit and therefore was susceptible to splitting. The strata of the stone established natural divisions in the ground surface, which divided the stone horizontally into beds of varying depths.

Miners and masons fostered an extensive repertoire of techniques and tools to extract rocks from their native terrain. Once a usable bed of stone was reached, it was necessary to establish a deep trench that would grant quarrymen access to the top and side faces of a block. A stone saw, or *frig bob*, established vertical cuts in the ground, which were then forced open by drilling. Blocks of stone, separated by splitting them at the base, were then freely disengaged from the quarry floor. The process of "plugs and feathers" required the quarryman to puncture a series of holes along the line of the proposed split then insert the tools into each hole with a sledgehammer.[60] **(Fig. 3.21)** A *three-legged lewis*, commonly known as "St. Peter's keys," consisted of "a parallel piece of iron between two dovetailed iron legs which held firm to the sides of the dovetail as the load was taken up."[61] Dating back to Roman construction, the chain lewis (similar to the chain dog) was operated to move freestanding pieces, or using pulleys and slings, placing the tool into a mortice, incised within the top of the stone. Quarrymen by the eighteenth century sparingly used items such as gunpowder explosives.[62] Once the topsoil was removed, they were directly confronted with a "top cap" of fragmented rag stone,

which could be utilized for burning into lime for agricultural or building use. Some of the upper stone beds provided hard-wearing pavers for city streets.

For example, masons endeavored to determine a stone's *bedding plane* — the position it could be laid in a building related to its bed's direction — and if it would be appropriate for a given type of architectural design. A *natural bedded* (horizontal) orientation formed a stack of wavy sheets while *tooth bedded* or *teeth bedded* (vertical layers), for example, were placed on the short end of layers standing up, inserted into arches and cornices. Stones with a *face bedded* (sheet plane facing out) orientation possessed a singular flat face with no visible ends, which was only used in architectural details. If there was extreme weathering, in this case, the sheets were liable to peel away from the surface, one by one over time.[63]

**(Fig. 3.22)** Run-of-the-mill journeymen portrayed in William Hogarth's *Sign for a Paviour* (1725) depicted the fate of quarried nuggets after their removal from the ground. Bawdy characters populate a London thoroughfare, centered upon two men wielding hammers presumably laying down stones and generating piercing noise while going about their duties. Shaped like a long pointed sickle, the paver's hammer was always paired with a series of sharp chisels. Literature scholar Ronald Paulson argues that Hogarth's *Analysis of Beauty* (1753) soon came under attack for its highly insular reading of English art and culture, despite his focus upon average men as his modern moral subjects.[64] Bernadette Fort and Angela Rosenthal propose that Hogarth's bodies exemplify cultural, racial, and sexual differences that reflected eighteenth-century preoccupations with self and otherness.[65]

Masons, like Hogarth's paviours, were often divided into smaller sub-groups, such as *freemasons* who literally cut detached blocks of stone, according to their physical tasks of labor. Rough shaping was always completed at the quarry site, in order to reduce the weight of each block before transportation. Master masons supervised the quarrying and purchase of pre-cut stone. He selected given blocks and arranged for their carriage, preparing full-scale drawings needed for the specific details for a building (known as "setting-out"). *Banker masons*, labeled by historian Alex Clifton-Taylor, carved stones into various shapes on their bench while *fixer masons* were concerned with the actual positioning of stones within a building. Typically, the harder the stone, the more difficult it was to achieve regular coursing throughout its composition. An iron pitcher was applied for taking off surplus stone around the edges of a rough block when preparing a worked surface on the block. Afterwards, a narrow chisel was exercised to work a small margin around the face of the block, followed by the use of a punch for spalling off surplus stone when working down to a finished surface. A boaster was employed for broader surfaces that could not be handled by a chisel, and a coping saw used at the mason's banker when hand working freestones.[66]

For Gothic and Tudor houses, masons fabricated a surplus of architectural details — door and window mouldings, tracery, dripstones, string-courses, set-offs to buttresses, gable-copings, battlements, crockets, roof-pinnacles, and finials. The industrial arts, including stone cutting and masonry, were often communicated through drawings, models, printed publications, specialized treatises, encyclopedias, as well as clubs and economic societies. Invoking Mary Douglas' "world of goods," Fox suggests that we should closely investigate the knowledge of nature and matter that emanates from the

skills of artisans, quarrymen, and miners.[67] "Workshop practices have been exposed not as the mindless following of rules or recipes," she asserts,

> but as processes of knowledge-making that involved extensive experimentation and observation. There is an increasing consensus that the knowledge of artisans, hitherto overlooked, needs to be understood and valued in its own right, overcoming crude dichotomies of knowledge and practice, contemplation and action.[68]

This renewed emphasis on praxis stresses the difficulty attached to crediting the work of tradesmen, a belief shared by contemporary economic historians who believe that the Industrial Revolution cannot be explained simply in terms of "inexorable economic, social or demographic forces." The early modern reputation of artisans was a misleading conception at best since it was, in fact, difficult to achieve independence or autonomy over their works of art. This conception was wrongly interpreted as a golden age for craftsmen who were thought to own their own tools and materials, and enjoy well-earned recognition. The artisan's technical skills did set him apart from his peers of common laborers, and in respect to their refinement of personal rituals and sense of collective identity, artisans were particularly commended for their reputable techniques. Their dedication to an individual vocation set them apart from connoisseurs and dilettantes, who did not produce any creative or innovative products of labor and only sought to familiarize themselves with historical references to enhance their own sense of self-worth.

Referring to tradesmen, John Evelyn's experience of English building operations convinced him that "there was hardly a nation under heaven more conceited of their understandings and abilities and more impatient of direction than our ordinary

mechanics..."[69] The hard-working, self-supporting, and technically proficient individual was always admired; industriousness was prized not only for its practical utility but as a moral quality that imbued the individual with dignity and communal acceptance.[70] Opined Josiah Tucker, "the rules of religion and the rules of social industry do perfectly harmonize, and all things hurtful to the latter, are indeed a Violation of the former. In short, the same good Being who formed the religious System, formed also the commercial." Fulfilling their duty to society and God who supervised the public good, tradesmen and laborers embraced religious and secular values about the character of hard work. Industry, William Adams stated, made "the artificer and the labourer as useful and valuable as any members in society."[71]

Masons and tradesmen prepared large quantities of stone for shipment to other parts of Great Britain and Europe, and in fact, the visibility of stone moving through the English landscape was most prominent in the transportation means for building supplies. Horse-drawn carts were the most effective choice until the nascent development of railways and waterways. Goods such as stone and timber, despite their immense weight, could be transported cheaply over great distances. For inland areas, the low tonnage and shallow draught of early merchant ships was a distinct advantage, and as a result, many towns became thriving ports filled with international trade. Water-borne freight could employ the movement of small streams. The Thames River's significance for developing infrastructure is depicted in images such as John Rocque's *The Cities of London and Westminster* 1740. Ralph Allen was one of thirty-two proprietors of the Avon Navigation that opened between Bath and Bristol in 1727, valued at five shares of four hundred pounds; surprisingly, this technological development encouraged the typology of the

eighteenth-century spa. He soon introduced bath stone at St. Bartholomew's Hospital designed by James Gibbs, a cheaper alternative than Portland stone. Some of the difficulties associated with supplying stone stemmed from political conflicts during England's war with Spain, a French intervention that occurred several years later, and the subsequent Jacobite rebellion of 1745.[72]

National transportation infrastructure included a canal system that allowed the owners of quarries to access waterways in order to ferry their stone to more remote locations between 1790 and 1830. Railway networks that reached large parts of Britain by 1855 charged cheap tariffs, and, in effect, halted restricted geographical isolation, allowing these industrial products to reach other far-flung locales. **(Fig. 3.23)** The drawing of Ralph Allen's railways for the transport of stone as it appeared in 1750 may have made with a *camera obscura* that had the effect of flattening the steepness of the summit of which the quarries were located.[73]

Quarry owners on the Isle of Portland were extremely familiar with the potential hazards to which their valuable cargos were subjected. In June 1740, the ship Dorothy bound for Dublin with a cargo of stone was captured in the English Channel by a Spanish vessel. Similarly, Matthew Elliott, a stone merchant from Canterbury, expecting a consignment of stone from Portland, refused to pay any salvage costs involved when the vessel carrying his order was grounded off the area of Beachy Head. Sand and gravel, lime with bricks, stone, and timber, were regularly carried from a river or canal-side by horse and cart. Many building accounts refer to a "load" of a particular commodity, which consisted of 27 cubic ft. that was equivalent to a cubic yard. Depending on

moisture content, a cubic yard of sand weighed about one ton – an indication of the average carrying capacity of a traditional cart.

**Materializing style**

**(Fig. 3.24)** Shifting away from the logistics of transportation, architectural construction employed stone as a material of social status but paid greater attention to articulating its tangible properties in private residences and civic buildings. Building legislation enforced rigorous guidelines that disciplined the practice of architecture, deploying codes to control the much-needed variety of techniques that co-existed in the city. Georgian era architecture, comprised of many styles including the Gothic revival, was defined by two great events — the Great Fire of London (1666) and the English Revolution (1688). Architectural historian James Ayres claims that the building process was suspended between modes of medieval tradition and industrial innovation. Between 1680 and 1840, a labor-intensive craft-centered trade gradually converted into a highly mechanized industry. Timber building was strictly prohibited since 1605, and the uniformity of street elevations in the city and up to suburbs one mile from the center became a necessity. Brick and stone redefined the expression of Georgian England, transforming wooden tenements into regulated rows of housing with public squares. Two years later, these provisions were extended to two miles beyond the city's boundaries. A 1615 proclamation for brick building under James I asserted that compared with "stick," brick was far more durable, safe from fire, beautiful and magnificent. The Act of 1657 stipulated that new houses within the cities of London and Westminster, their liberties and suburbs with the borough of Southwark, were to be constructed from brick or stone,

without jetties. Elsewhere within ten miles of the city, new buildings were expressly prohibited and those who contravened this stricture were to be fined. In 1707, the Fire Prevention Act demanded that new buildings were to be constructed of brick or stone, with party walls and parapets. Timber eaves and cornices were prohibited; the act applied to parishes that fell "within the bills of mortality."[74]

House building, in Maria Edgworth's novel *Vivian*, was one of "those objects for which country gentlemen often ruin themselves."[75] An extensive and complex organization of the craftsmen who worked on a civic or private residential design demanded a particular sequence of labor, whether dealing with brick, stone, or plaster. A plasterer, for instance, worked from a staging set beneath the ceiling area but before the floorboards or wooden wainscoting was put into place. Robert Adam and William Chambers each employed their own favored teams to complete plasterwork or carved ornament – Chambers fancied himself to be a "very pretty connoisseur in furniture" and was not above correcting furniture makers such as Thomas Chippendale when discussing aspects of cabinetry.[76] There existed great economic incentive to maximize the use of existing materials available on an estate. Stone assumed a rather minor role in comparison with clay brick available in two varieties, grey for walling purposes and red ones for lintels and window dressings. Both stone and brick were occasionally cleaned for building internal walls, and glass was re-fixed for domestic offices. The use of recycled timber, however, was far more problematic. Old hardwood became difficult to cut into individual planks, its attractiveness reduced if a great deal of reworking had to be undertaken.[77]

Introduced by Inigo Jones, Portland stone was utilized in the restoration of St. Paul's Cathedral on its north and south fronts, making its way into porches, window dressings, cornices, and fireplaces. Wren employed Portland stone either as the principal structural material or in combination with brickwork in many other churches and buildings for which he was responsible, including: Old Temple Bar, The Monument, College of Physicians, Chelsea College, Towers of Westminster Abbey, Church of All Hallows the Great, All Hallows, Lombard-street; St. Andrew's, Wardrobe; St. Andrew's Holborn; St. Antholin's; St. Bride's, Fleet-street; Christ Church, Newgate-street; St. James's, Westminster; St. Magnus's, London Bridge.[78] Augustus Pugin, in the case of Mount St. Bernard's Abbey, was aware of the difficult nature of the local metamorphic slates and igneous rocks of the Charnwood Forest, producing a design that displayed these hard, angular intractable stones with discernible effect.[79]

**(Fig. 3.25)** Thomas Girtin's *Cottage at Newcastle, Northumberland* (c.1797), for example, proves that bucolic vernacular residences survived despite the overwhelming predominance of Palladian, Gothic revival, and neoclassical motifs for architectural construction. Goodhart-Rendel describes Endsleigh (1810) in Devonshire as a typical prototype:

> They are usually low and irregular, and covered with steep roofs heavily overhanging at the eaves and the verges. Their wall surfaces are of rubble stonework, of Roman cement, or of rough-cast plaster; since visible brickwork was for long condemned by all persons of taste as prosaic and mean. Their windows were large, (small lattice casements being allotted only to the labouring classes), and on the lower floor generally opened down to the ground...the cottage aspect outside was a concession to the surrounding landscape, but the blessings of civilisation were preserved indoors.[80]

Thatching and wood beams remained staple elements for those who could not afford the luxury of stone. Masonry afforded some of the most direct evidence of the close relationship between aesthetic expression and material, more so than the materials of brickwork or carpentry. Stringent economy often demanded a mixture of brick and stone, for instance, used by Wren in many of London's churches and in lesser buildings such as Middle Temple Gatehouse.

**(Fig. 3.26)** Granite, a popular choice, lasted well throughout the nineteenth and twentieth centuries. The industry was centered in two major areas, that of northeast Scotland around Aberdeen and Peterhead and in southwest England in Devon and Cornwall. Besides granite, other types of stone were prevalent in Georgian building practices. For instance, in the Radcliffe Camera of Oxford University (1737-1747), the building contained Headington hardstone, with the channelled ashlar of the lower story made from a similar type of rock. **(Fig. 3.27)** In contrast to granite, Binstead stone retained a "more crushed" appearance with no recognizable fragments of fossil shells, but was also available in large blocks. Unlike Quarr Abbey stone, it embodied a considerable quantity of iron, which upon exposure to the elements, sometimes changed its naturally creamy color to rich dark russet. Binstead specimens were employed for portions of the Chichester cathedral, the abbeys of Beaulieu and Netley, and much of the Southampton area of England; it can be seen to great advantage at Winchester College. Both these stones, but especially Quarr Abbey, are in evidence on the front of the Church House in the Close together with some Caen and Portland stone for the nineteenth-century porch.[81]

Eighteenth-century treatises on chinoiserie, Indian or Mughal inspirations, Palladianism, and the Greek revival assisted in disseminating reigning opinions on the

choice of available architectural styles aligned to given political perspectives. A few years after the signing of the Treaty of Utrecht (1713) that secured a British trade monopoly in the West Indies, the Tories used architecture as a vehicle for partisan propaganda. They provoked an aggressive Whig response from Lord Shaftesbury who, as the author of "Concerning Art, or the Science of Design," attacked the Baroque school for its rejection of rational principles of design and its subservience to French influences, its inability to provide "more serious and noble" monuments.[82] Colen Campbell's compilation *Vitruvius Britannicus*, or *The British Architect*, under patronage of a Whiggish second Duke of Argyll, displayed the most influential buildings erected in England from the early seventeenth century until the present days and codified the works of Inigo Jones and John Webb as canonical designs. Nicholas Hawksmoor had been fascinated by the medieval Gothic past, working on buildings such as Beverly Minster Yorkshire (1716-20), designing All Souls' College, Oxford in 1716-35, and finalizing the towers of Westminster Abbey (1734), completed by John James. William Kent had designed a house for the antiquarian Henry Pelham in Esher, Surrey (1733), with symmetrical, battlemented wings and Gothic windows to encase the Tudor structure.

William Halfpenny's design for the Protestant Cathedral at Waterford in Ireland represented a rustic vernacular impulse within architecture; it was submitted in 1739 but was never built, revealing his misunderstanding of Palladianism. His connections to Ireland were forged through his residence in Bristol, from which he issued his *Perspective Made Easy* (1731). From 1722, he published or contributed to over twenty-four books and along with Langley, judged to be one of the most prolific architectural propagandists of the mid-century.[83] Male figures such as Halfpenny and Langley, who

possessed less influence than Adam or Chambers, produced scores of printed pamphlets on the available stylistic choices that any Englishman could make. Observed by British scholar Amanda Vickery, the history of architecture in Georgian England has been extremely masculine in its tenor, with the exception of such women as Eleanor Coade, the cabinetmaker Alice Hepplewhite, and the silk designer Anna Maria Garthwaite.[84]

William Chambers, who had promoted early Palladian principles, now relented in his enthusiasm since the publication of his *Treatise on Civil Architecture* (1759), later revised in 1791. Pulling away from the Renaissance-derived proportions of music and architecture, Chambers insisted that building was not merely a method of "heaping stone upon stone," but materials in architecture were like "words in Phraseology; which singly have little or no power, and may be so arranged to excite contempt; yet when combined with Art, and expressed with energy, they actuate the mind with unbounded sway..."[85] Invention was able to facilitate the act of labor, where ingenious contrivances supplied domestic wants and foreign markets with greater ease.[86] What he called "productions of architecture" existed as lasting monuments that commanded universal attention and recorded for posterity the greatness, dignity, virtues and achievements of those they commemorated. Architecture prepared the way for commerce – a transition that gradually brought wealth, which, in turn, introduced luxury. He argued instead for an aesthetic grounded in architecture, derived from a design's convenience, custom, prejudice, or assertion of ideas.[87]

In a desire for novelty, John Carter, who was initially employed as a draftsman and eventually took full responsibility for *The Builder's Magazine* (1774), devoted himself to restoring the significance of historical references. He copiously drew

revivialist designs for *Specimens of Ancient Sculpture and Painting* (1780-1794), *Views of Ancient Buildings in England* (1786-1793) and *The Ancient Architecture of England* (1795-1806). His ambitious project for St. Peter's Chapel in Winchester (1792) was demolished.[88] Carter was less concessionary about the purported value of the Gothic style; his version of the Middle Ages was a period marked by heroism and chivalry that witnessed a flowering of the arts, architecture, painting, music, literature, and sculpture. For the public audience of *The Builder's Magazine*, since Britain had been at war with France for five years, and for a brief period, thought to be under the threat of invasion in 1802, this produced a sharply nationalistic mood that was particularly receptive towards the merits of ancient architecture in England. Carter was shrewd enough to conjoin his defense of these patrimonial glories with the righteous beings of the Monarchy, Church, and Constitution; the classical tradition long associated with France was made even more untenable since it was framed as dangerous innovation, full of suspicion.[89]

Horace Walpole confidently explained the discordant schism between the two fractious styles; Palladianism was only to be used for public buildings that necessitated gravity, while the Gothic revival inspired what he deemed to be "charming irregularity." He maintained that the unrestrained licentiousness of the Gothic style remained, however, secondary to the superiority of classical taste (since Gothic was a corruption of Roman architecture). Walpole had also turned his attention to Twickenham on the Thames as a proper site for a residence outside of London. Strawberry Hill preserved two significant interiors from its early gothic phase including the Great Parlour (1753-54) where meals were taken, jokingly referred to as the Refectory, and the library, which housed his collection of antiquarian books. Walpole had formed a personal "Committee of Taste"

composed of himself, his close friend John Chute, a gentleman architect, and Richard Bentley the son of a Cambridge academic. Eventually, Walpole and Bentley disintegrated their friendship, and the third seat was given to Thomas Pitt of Boconnoc, the architect of Stowe House and patron of Sir John Soane.[90] Walpole promoted the talents of the architect James Wyatt who he recommended to his friend Thomas Barratt for work on his house called Lee Priory in Kent. Wyatt was also engaged by Walpole to build an office block based upon a design of 1774 by James Essex in "a collegiate style of Gothic."[91] **(Fig. 3.28 and 3.29)** In an ink drawing of Strawberry Hill's facades, Chute brings forth the apparent desire for a mawkish past is clear, marked in the succinct lines of the villa's turrets, minute spires, and framed elongated windows. Robert Adam's Gothic variation of the same building draws upon comparable elements, placing a medieval rosette window at the center of the composition.

Sanderson Miller boldly embraced the contradictions of the Gothic revival and utilized a combination of mixed styles for many of his designs – a vernacular cottage at Edgehill in Warwickshire, castle folly Hagley Hall in Hereford, Worcester (1747-8, 1754), and Palladian Shire Hall in Warwick. A high demand for skilled artisans who could copy given architectural styles endured within the building trades. In 1751, for instance, the Bishop of Durham, Richard Trevor, accepted a design for a gothic chimney-piece and accompanying wall-decoration from Miller in exchange for a room in his residence, Durham Castle. He requested that Miller to supply him with a competent carver, explaining, "I am afraid our People of Durham do not much understand this kind of Antique Work." In the case of Kilkenny Cathedral, Bishop Pococke promised having a London carver provide ample models for his Irish craftsmen to emulate: "I have thought

of having one stall executed in London, by which we may judge of the expense & it will be a pattern for the Carver in Ireland who can afford to work cheaper: & one piece also of every kind of carv'd work."[92]

Henry Keene, in a similar vein to Miller, designed Guild Hall (1757) at High Wycombe, Buckinghamshire, which was originally Palladian, then used the Gothic style for Hartwell Church, also in Buckinghamshire (1753-5). Keene redecorated the chapel of Hartlebury Castle for the Bishop Maddox of Worcester in 1750 to echo a proper sense of archaeological accuracy; Walpole had a severe attack of agoraphobia, which had prevented him from visiting and recording his impressions in 1753. Keene's St. Mary's Church was an octagonal building with a clerestory of quatrefoil windows above pointed windows; the design represented a simplification of ornament and the strengthening of visual stability, which might be accounted for the difficulty of finding competent carvers and masons in the Gothic style, especially in places that were far from London. It must account, architectural historian Michael McCarthy presumes, for the sustained prevalence of more malleable materials such as stucco and papier-mâché in the ornament of the period.

**Acoustic operations**

Natural properties of stone assumed an inconspicuous and non-ornamental role in theater construction, becoming an indispensible material for transmitting acoustical sound. English theatre design remained equally modest since in Great Britain, such building practices were not regularly subsidized by public funds. Erected behind a terrace since land was less expensive, some theaters could have been easily confused for town

halls. George Saunders' *Treatise on Theatres* (1790) derived the ideal theater from the models of Claude-Nicolas Ledoux and other French architects; his theater was conceived with a circular auditorium, rather than a horseshoe which was a poor shape for viewing the stage even though excellent for hearing voices.[93] Even Ledoux mistrusted drooping lines and broken forms that were crushed beneath the weight of false taste; he instead implored that stone be restored to its own truth, "at the touch of art, will amuse a new feeling and develop its own qualities." By restoring architecture to its base figures, raw materials such as stone would be returned to their true nature embodying "a choice that is moral as well as aesthetic."[94]

Architect Samuel Ware recommended an iron roof as well as brick material, stone vaults, and the plausible value of the pointed arch as evident in Gothic architecture, naming Henry VII's chapel in London as an instance of simple vaulting.[95] He commented, "stone is a material sufficiently rigid, is notorious, every arch proving the fact," proposing to exploit stone's natural attribute for reflecting sound.[96] **(Fig. 3.30)** In suggesting brick and stone vaultings for fire prevention, Ware mentioned Freemasons as craftsmen who carried the obscure secrets of creating these vaults – the mystery of constructing piers to resist the thrust of a stone vaulting. In St. Paul's Cathedral, for example, the sub-dome was surmounted over a circular area of 112 feet in diameter, with a thickness of two bricks or eighteen inches. Stable vaults thus were not necessarily constructed for sound transmission yet moreover, they fulfilled structural requirements for a public building. For the convenience and propriety of using a space between the ceiling and the roof for a theater, such as one in Drury Lane Theater, the question was raised if it would be double-vaulted or whether a wood roof should be erected over the

vault, forming a ceiling such as in a cathedral. Building materials, he instructed, should be adapted to render the sound soft and pleasing to the ear, or promote tunable sound, "that the resonance may be enough for the music, but too little for any occasional noise in the house; perhaps enough to lengthen out each sound, until its succeeding sound be fully produced." Forms, which were "most unpleasant for conversation in private life," were regarded as most eligible for a theater – "rooms without furniture," "plastered rooms rather than papered: rooms plastered on brick rather than on battens" and "rooms whose internal surface is stone throughout, more than any other."[97]

Acoustics were paramount for municipal enjoyment whereas the exterior appearance of a theater was reduced to a principle of secondary consequence. The transmission of sound drew upon stone's structural composition to absorb noise and reflect reverberations within a building. "Stone is slated to produce a harsh sound," Ware pointedly declared,

> but upon what experiment, or by whose sense of hearing, some pains has been taken to discover. Each writer repeats the assertion without giving his own authority, or that of anyone he knows. The author does not pretend to have a musical ear, and acknowledges that he derives pleasure from those sounds which generally captivate the vulgar; but those who are scientific in music and have fine ears, have been delighted, with him, by the sounds issuing from the choirs in our stone cathedrals.[98]

Comprising a main auditorium surrounded by actors' dressing rooms, waiting rooms, and landings, Ware's ideal stone theater allowed sound to reverberate throughout its corridors and spaces, allowing the structural properties of this material to become a significant addition to the ongoing development of the Georgian interior. The English playhouse, transfigured into an eighteenth-century cathedral, stretched back into its own antiquated

history in order to sustain a harmonious appreciation for the longevity of tradition and the prevailing impositions of the changing times. Such a building enabled stone to convey its ancient origins in the service of modern architectural expression.

### *Lithodipyra* reproductions

Natural stone remained an overwhelming material of choice for municipal buildings such as theaters, but as a point of interest, English architects and artists also helped to popularize artificial stone as a pecuniary alternative for architectural ornamentation. As a ceramic mixture of crushed stone and lime, Coade stone, named after its inventor, was employed to mold sculptures, busts, and portrait medallions as well as exterior architectural details, garden and park embellishments, heraldry, and commemorative monuments in the likeness of real stone. Plaster molds were oiled inside to facilitate the removal of plaster casts from the ceramic material. Coade stone did not require a mold to be oiled since the final product would shrink as it dried and easily drop out of the molds. The principles used in making a ceramic artificial stone were extremely different from concrete, which used materials that were hardened through chemical action. Untreated provisions were not converted into the final product until they were subjected to considerable heat in a kiln. Earthenware, which was porous, for example, possessed only a small portion of clay vitrified in the kiln; stoneware, like Coade stone, was non-porous, in which the larger proportion of the clay melted to a glassy consistency. Porcelain, which is the most highly vitrified and translucent, was the most difficult to make into large-scale objects, since its clay component tended to liquefy in the kiln.

Mrs. Coade specified the date of the foundation of her factory as being 1769; yet her manager Daniel Pincot, however, had been in the same location making the same product for the previous two years. Parallel to a treatise written by amateur Richard Holt, Pincot had authored a pamphlet on artificial stone published in 1770.[99] His publication mixed common sense with gibberish. Pincot, who believed that ancient cathedrals were built in part from artificial stone, "stones of baked earth" were discovered almost directly after the Flood...or more probably long before the Deluge," later died in 1792.

One of Coade stone's most salient features was its minute rate of shrinkage; it only reduced from ten percent, and in some cases, up to twenty percent in drying and firing, a further half-inch in firing, just over eight percent. Pre-fired clay as one of the ingredients was not unusual; it was ground into powder and baptized as "grog." Mrs. Coade sanctified her invention with a more mellifluous name, *lithodipyra*, a fictional word put together from three Greek roots meaning "stone," "twice," and "fire." The most accurate contemporary description given by David Laing in Custom House (1818) relates Coade stone as a terracotta material which,

> It combines in one mass pipe-clay, flint, sand, glass, and stoneware, that has already passed the furnace. These ingredients were ground into a very fine powder, and are mixed in the proper proportions, and the whole is well kneaded together by means of the addition of water. In this state it forms a kind of paste that has the ductility of the clay usually employed in modeling; it is now wrought into the form desired...and when finished it is left to dry gradually. When thoroughly desiccated, the performance is placed in a kiln, where it undergoes an intense white heat; and being allowed to cool it is now complete.[100]

Since 1784, around 778 distinct items including vases, urns, and chimneypieces were available for purchase. Original molds lasted for decades, and their copies persisted in various designs – for example, a Borghese vase modeled in 1771 could possess a last

edition stamped around 1827. Supplementary molds for details were made separately and then applied using slip (liquefied clay) as an adhesive. Firing in the kiln fused the ornamentation permanently on the background of the decorative piece. Diminutive items in the Coade catalogue were specified down to 1/8 inch; this detailed dimensional control allowed freizes and other pieces to be made to fit successfully into existing masonry work, as precisely as if they had been carved in stone.

To the naked eye, a shattered piece of Coade stone was nearly indistinguishable from a chunk of natural stone. The precast surface was far smoother, varying from "something like slate, to something like emery paper, but never approaching the high polish of Victorian terracotta." Coade stone harbored lichens exactly like natural stone, and this was probably the reason why so few garden ornaments made at Lambeth Palace (?) are recognized for their imitative character. In general, it was very difficult to distinguish between Coade stone and natural stone apart from the sharpness of detail.[101] As a type of stoneware, it exhibited far less weathering or water staining than was expected from natural stone.

**(Fig. 3.31 and 3.32)** Eleanor Coade's commercial success was not astonishing since she was able to provide an eclectic assortment of statues, decorative pieces, plaster for indoors, lead and stone for outdoors, capitals, plaques, quoins, string-courses, friezes and chimneypieces. All of these designs could be incorporated into buildings in an analogous manner to natural stone features. In 1799, Mrs. Coade, in partnership with her cousin John Sealy, opened a showroom at Pedlar's Acre at the Surrey end of Westminster Bridge and published a handbook called *Coade's Gallery* to describe the layout and

exhibits which included many objects that were not in the catalogue. Her publication lists places where Coade stone had been used in the thirty years since the business began.

Robert Adam, with the assistance of his wealthy patrons, could have easily afforded natural stone, but instead he occasionally employed Coade's ceramic material for many neoclassical designs of low-relief medallions with Roman costumed figures and festooned friezes. He remarked that Dr. David Wark of Haddington in Scotland had obtained a copyright for plaster stucco in 1765 for such a cement, as an invention of his own; in 1773, a Swiss clergyman named Liardet, had obtained another for a similar formula. Both patents were purchased later by the Adam brothers, who named their newly uncovered concoction after themselves. Architects, masons, bricklayers, and plasterers were asked to bear witness to the superior duration of this newly invented stucco. Seeming unanimous in their opinion, the jury pronounced that that Liardet's cement, though not novel or precise in its applications, demonstrated better proof of its durability in standing three or four years than others would had done in thirty or forty years.[102] In 1796, James Parker patented a unusual hydraulic cement that he baptized Roman cement made from an argillaceous clay (*septaria*) originating in the seabeds of Harwich and the Isle of Sheppey. Requiring only twenty to forty minutes, it became an ideal material for working conditions affected by tidal waters or under heavily saturated conditions. These types of adhesives for stone gained greater strength than hydraulic lime but remained less powerful than Portland cement.[103]

**(Fig. 3.33)** Adam designed plaques in natural stone for the south front of Kedleston Hall along with copies of Medici Borghese vases fabricated from Coade's stone for the building's front steps. The Theatre and Market Hall at Bury St. Edmonds

had a fine display of plaques, with three swags of husks and paterae, on all four sides as well as capitals and urns in niches. Gosford near Edinburgh from 1790 combined a whole range of Coade designs which Adam had used previously elsewhere. This house had a stable block decorated with a number of oblong plaques and roundels selected from the catalogue, designs featuring the Judgment of Paris, and other special orders.[104] The Adams did not always forego the use of Portland stone for their favorite Roman cement.[105] Portland stone was used in Fitzroy Square, the last of their speculative works, as a type of veneer over brick, provided in thin slabs where the surface polished to produce the effects of marble.[106] James Wyatt in the Pantheon in Oxford St. employed plaques and statues, employing more Coade stone than any architect of the period. Francis Hiorne also experimented in Gothic variations at the Tetbury church in Gloucestershire (1777), possibly with windows in a cobweb pattern of perpendicular tracery, but archival documents register these ornamental details as being made from Tetbury stone.[107]

William Chambers, who was extremely familiar with imitation stone, enacted a convenient favor for Mrs. Coade in 1772. Horace Walpole had requested her to make him a pair of gate-piers near the chapel in the woods at Strawberry Hill. They were based on designs by James Essex on the early fourteenth-century tomb of Bishop de Luda in Ely Cathedral, and had crocketed spires covered with Gothic tracery, with tall, very thin piers at the corners, each with its own small pinnacle. Mrs. Coade charged £150 for them and Walpole had thought this too much. No agreement being possible, they decided together to resort to arbitration. Mrs. Coade appointed a Mr. Kemble Watley, while Walpole, aspiring higher, chose Chambers as his personal representative. He devoted himself to the

matter with admirable seriousness, visiting the factory and talking to the workmen, and in the end signed a certificate jointly with Watley: 'Upon examination of the books, models, casts, moulds etc. and upon questioning the men at the manufactory and inspecting into the nature of the work, we are of the opinion that the piers made and erected at Twickenham for the Hon. Mr. Walpole cost Mrs. Coade £151.14.10 exclusive of profit.' [108] The disappointed Walpole did not employ her services again even though she was proven to be a scrupulously honest trader by one of the most respected architects of the day. Chambers himself went on to employ Coade stone for the twenty-nine vases lining Somerset House's parapet (1787), whose design now survives in the Sir John Soane Museum.

Coade stone as a broadly accepted substitution for real stone confirmed the remarkable ascent of a synthetic material earning its own influential following. Its verisimilitude to that of natural stone provided a range of use for buildings and ornamentation. This imitation, as a hybrid between stone, brick, and ceramic, overcame the formal limitations engaged by its original counterpart and became an alternative building material equal to that of natural stone. Its man-made properties were infused with pragmatic function and openly superseded traits found in nature, once impossible to emulate, becoming operative attributes in their own right. Moreoever, Coade stone's versatility was directly derived from its structural constitution – dimensioning, ability to be shaped and cut, heat resistance, smoothness, and possibility for mass production.

The extraction of natural appearances, in this final example, was not predicated upon taking substances from the core of the earth, but instead, it relied upon human innovation to re-interpret the natural attributes of stone in built constructions. The more

tangible aspects of Coade stone from its resistance to its pliability transcended classical models of nature that relied only upon visual emulation. Stone's characteristics in many of the Gothic revival grottos, domesticated into the realm of architecture, were gradually converted into stylistic contrivances, forging what had been initially authentic into parodies of natural-ness. Employed by Adam and Chambers, imitation stone was given new meaning since both architects had delved not only into its design potential but also its chemical constitution that provided opportunities to create architectural ornamentation. Beyond the Gothic revival, the neoclassical style capitalized upon Coade stone's adaptations spawning other variations for building components that could be added to a façade or applied within interior spaces. For Coade stone, visual likeness was merely an exercise in surface emulation, but chemical alterations, however, had created a versatile genus of material that superseded even nature's own ambitions.

**Illustrations**

Fig 3.1: Francis Towne, *The Source of the Arveiron*, 1781

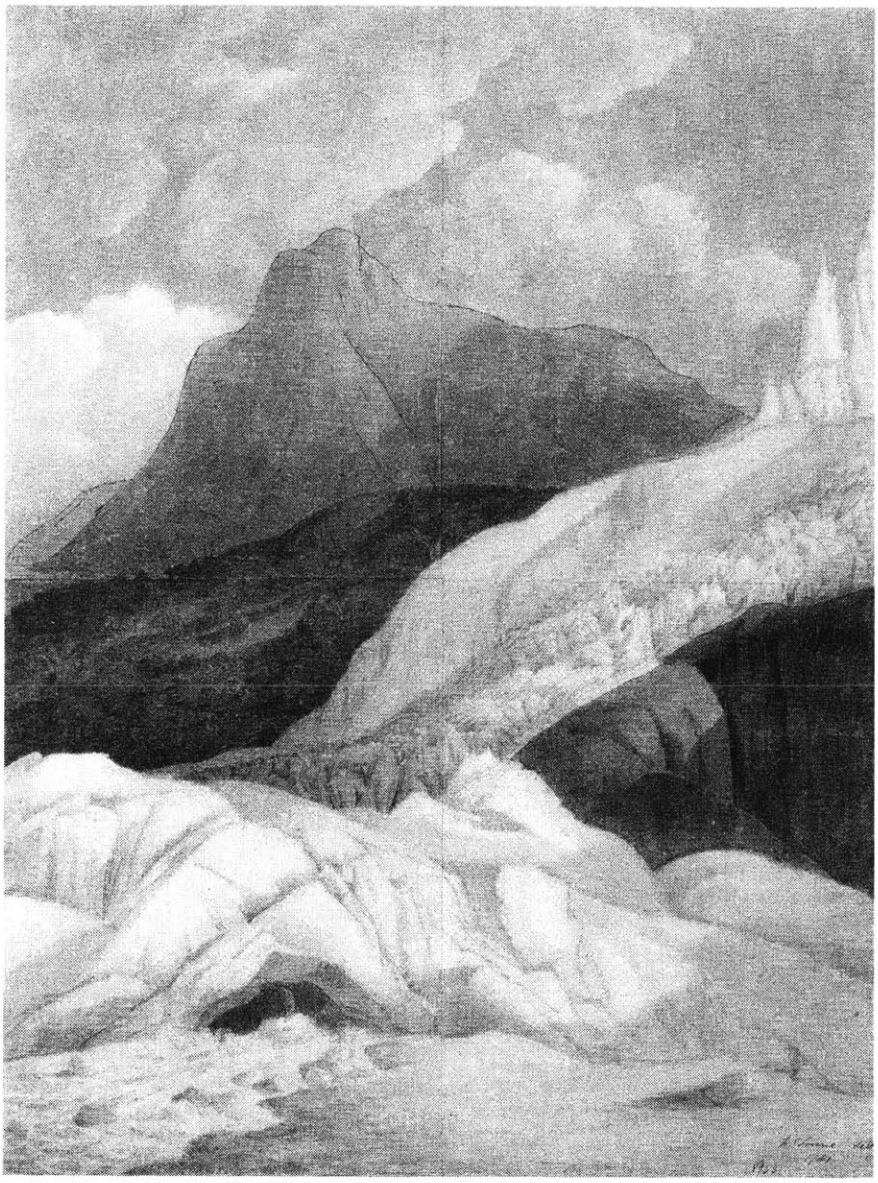


Fig. 3.2: Joseph Wright of Derby, *Vesuvius from Posillipo*, 1788 and *Grotto by the Seaside in the Kingdom of Naples with Banditti, Sunset*, 1778, Yale Center for British Art, New Haven

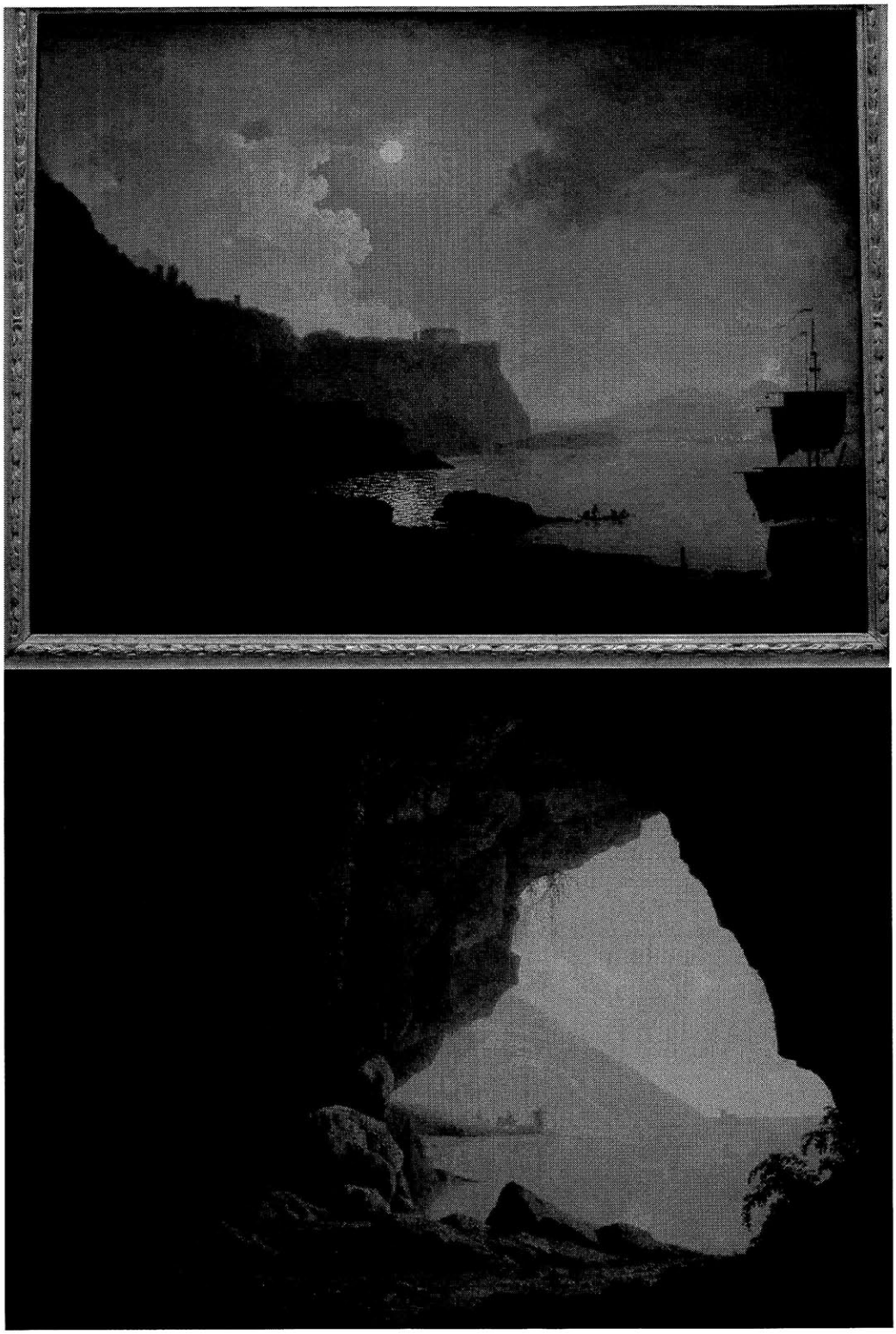


Fig. 3.3: David Roberts, *Destruction of Pompeii*, Yale Center for British Art, New Haven

Fig. 3.4: William Stukeley, *Ground Plot of Avebury*, 1724, Society of Antiquarians of London

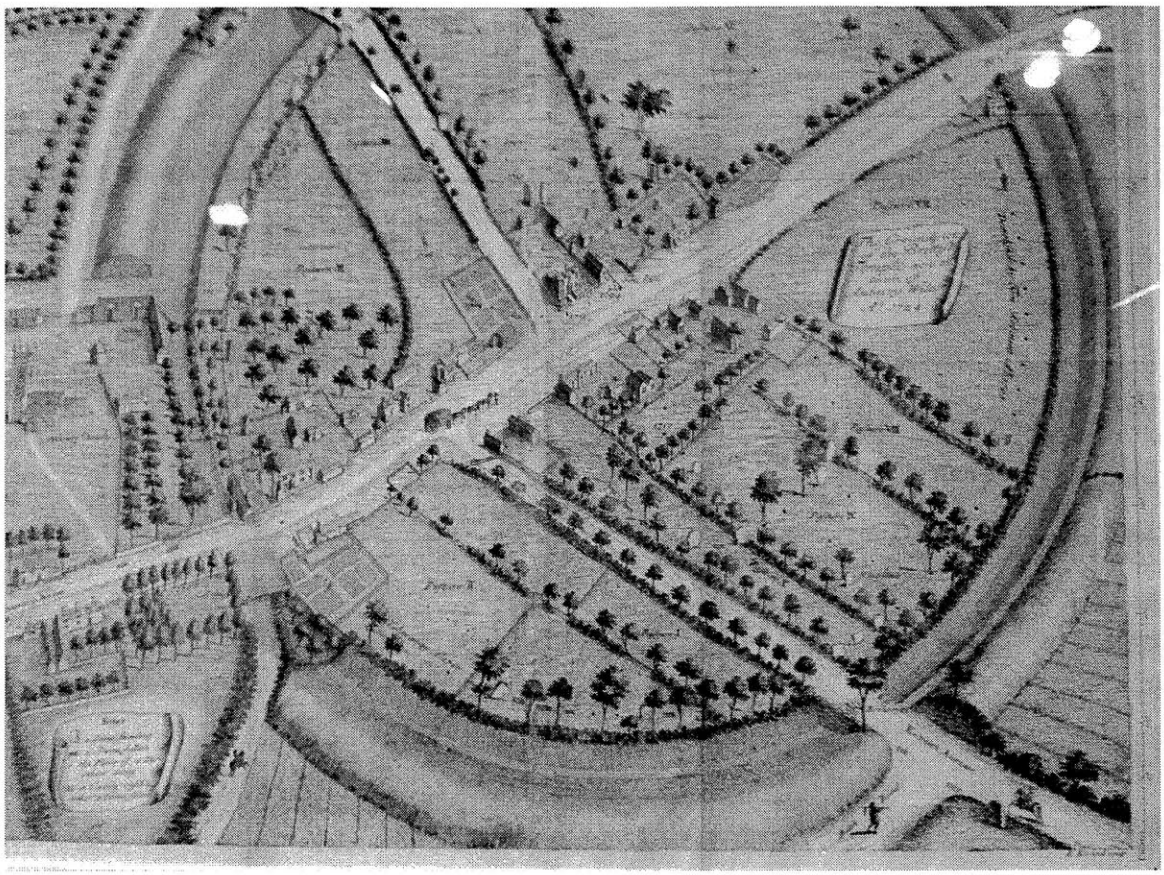


Fig. 3.5: Paul Sandby, *Lord Hopetoun's Lead Mines*, 1751, Yale Digital Content

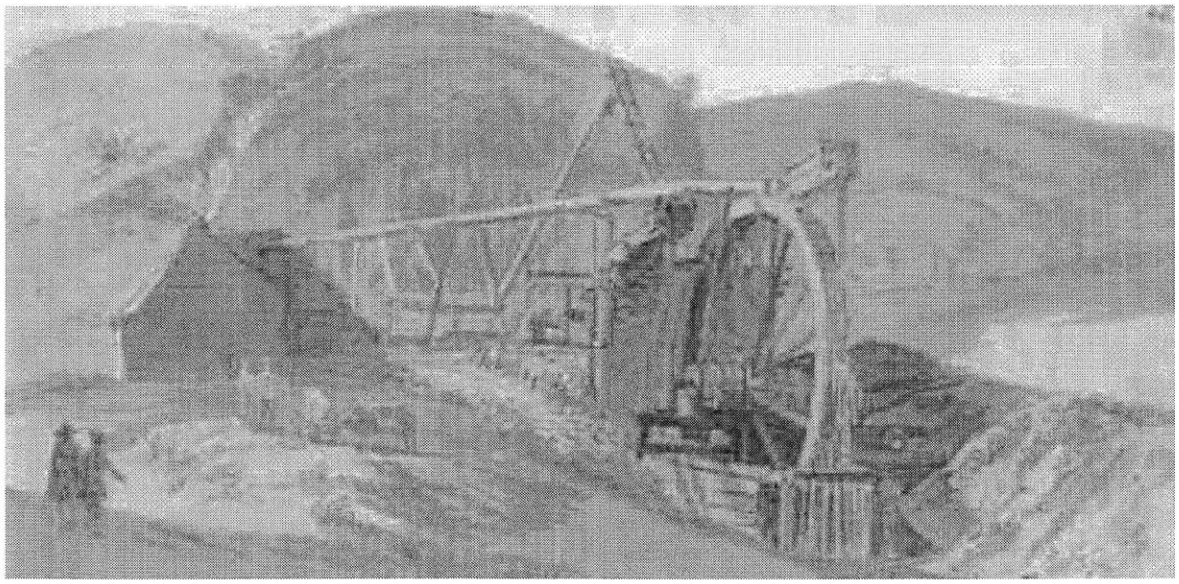


Fig. 3.6: John Ruskin, Limestone cleavage: Talloires, 1862, dossier at Yale Center for British Art

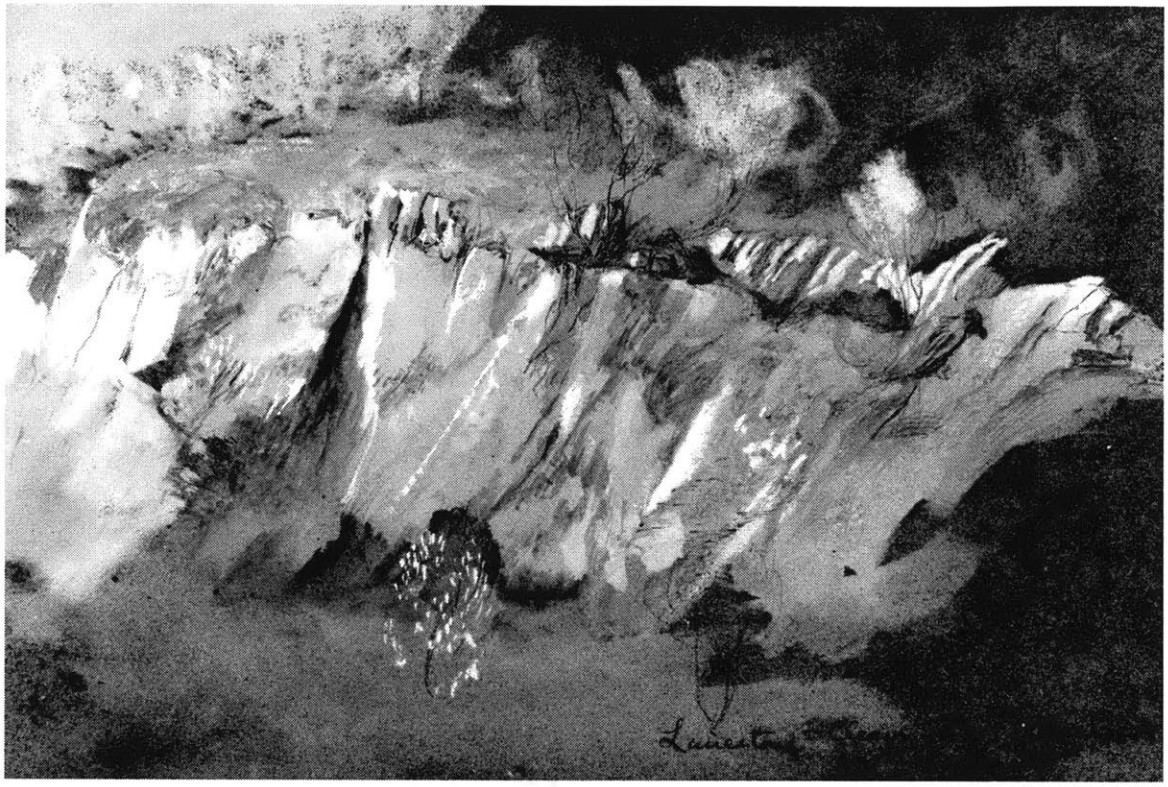
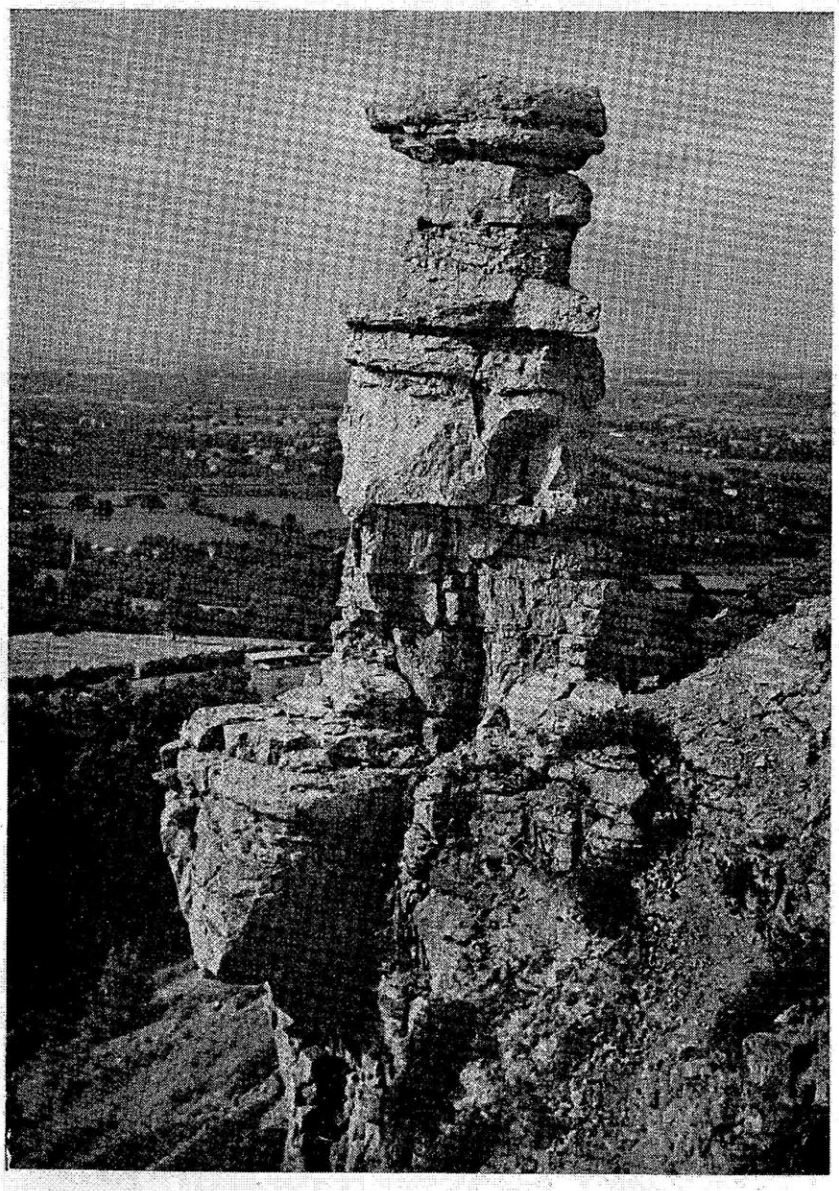


Fig. 3.7: Devil's Chimney in Cheltenham, England



65 THE DEVIL'S CHIMNEY, ABOVE CHELTENHAM

Fig. 3.8: Jacob Schbebbelie, Treasure hoard from Trewhiddle, Cornwall, 1788, Society of Antiquaries of London

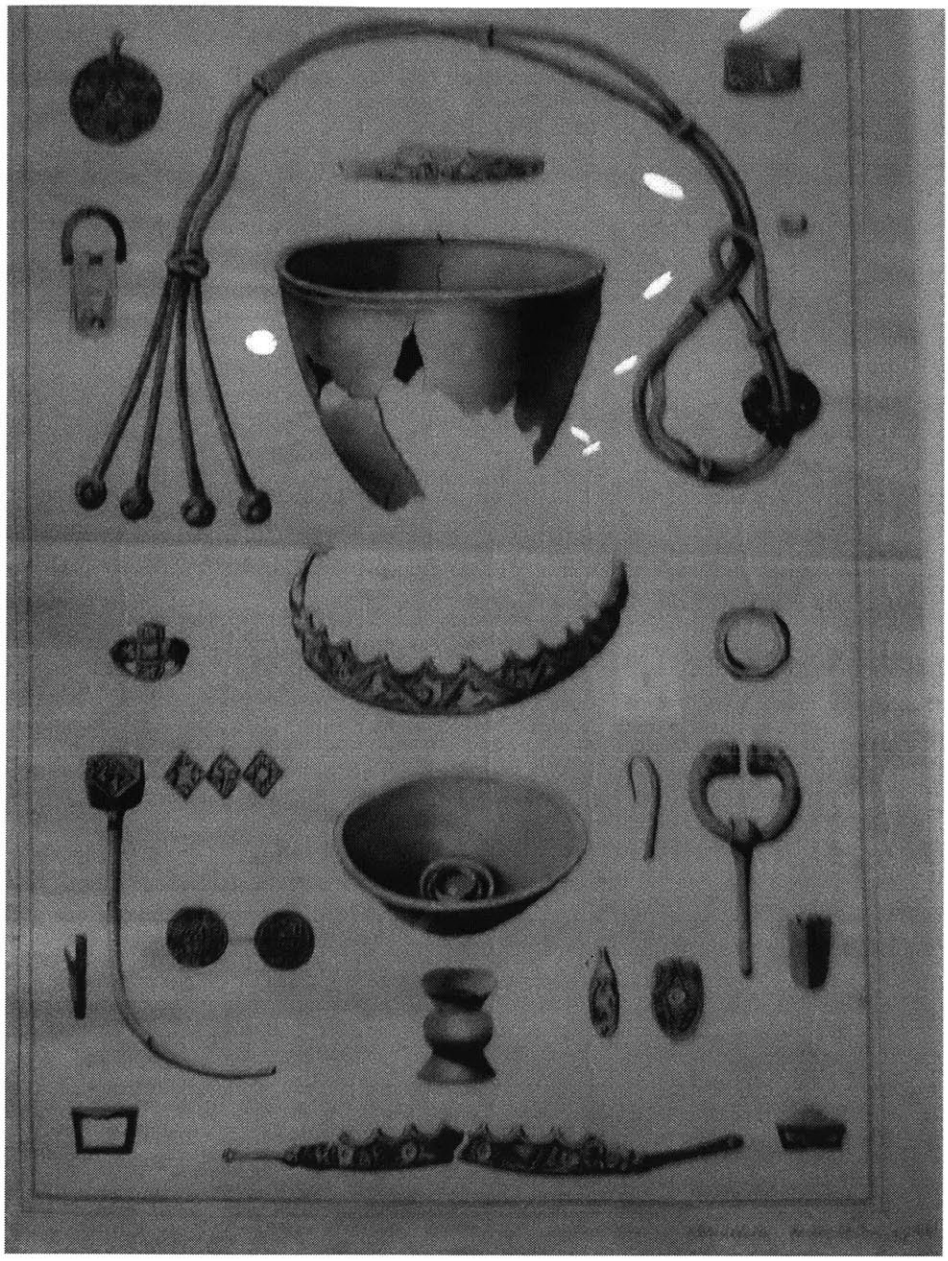


Fig. 3.9: Thomas Richard Underwood, Flint weapon found in Hoxne in Suffolk, 1707, Society of Antiquaries of London

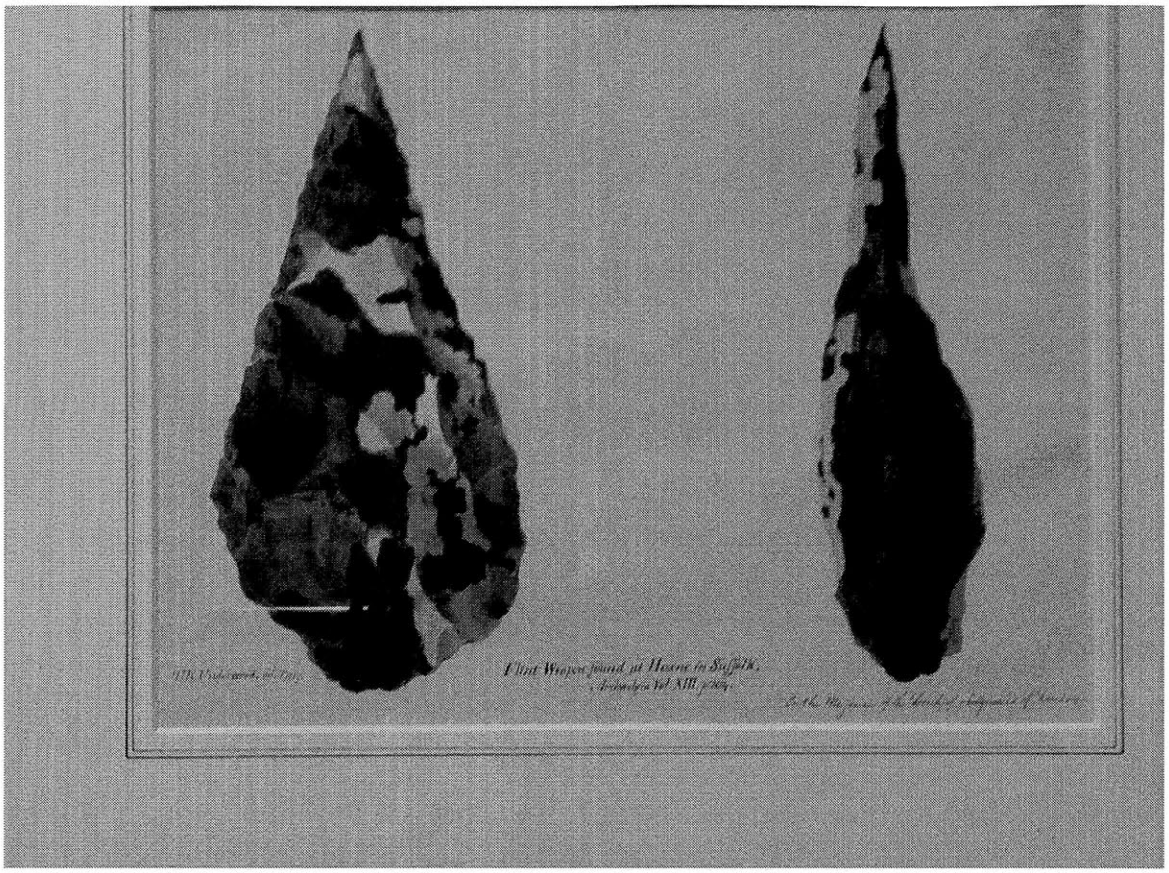
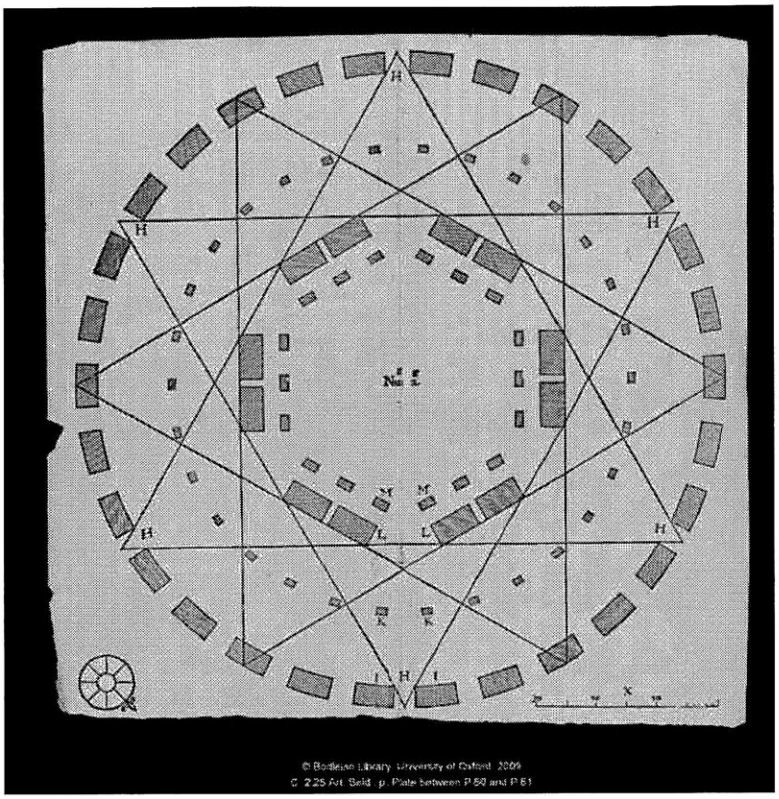
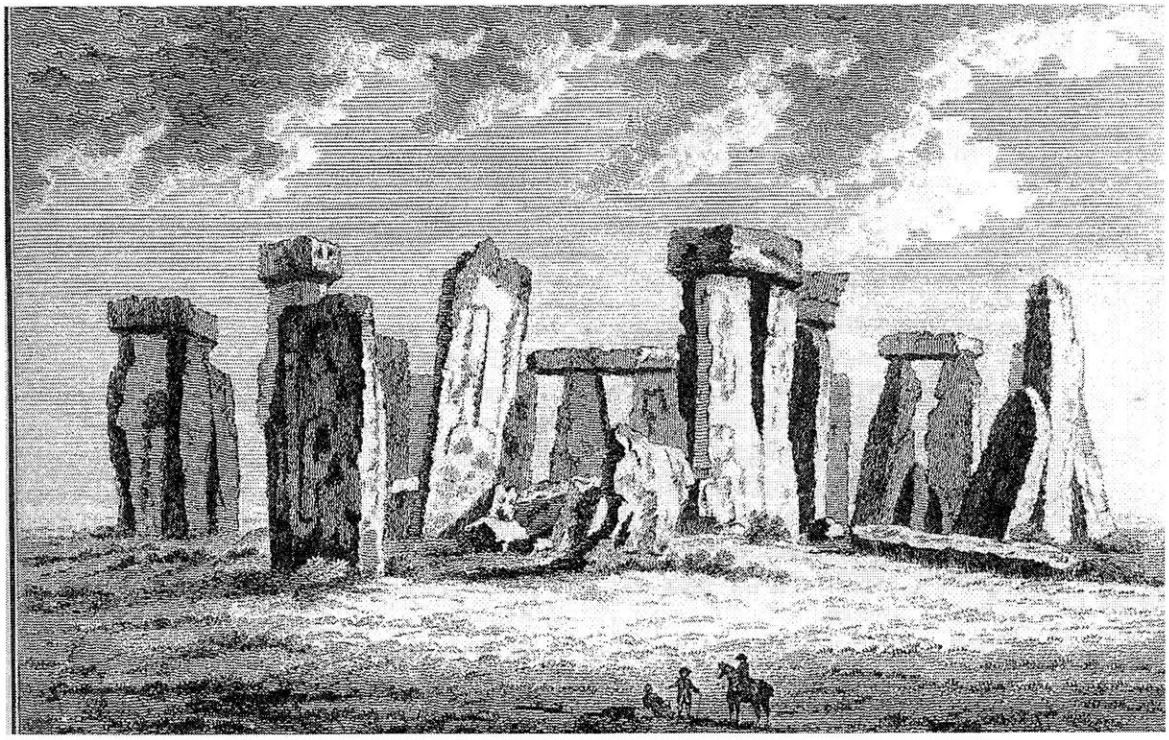


Fig. 3.10: George Heriot, *Furness Abbey*, John Inigo Richards, *Corfe Castle*, 1764, and John Constable, *Hadleigh Castle*, 1829, Yale Center for British Art

Fig. 3.11: Inigo Jones, *The most notable antiquity of Great Britain vulgarly called Stone-heng on Salisbury Plain*, 1655 and Buck Stone, from the *Antiquarian Repetory*, 1776-84



Unknown author, *Heal-stone*, 1781?, and J. Flowes, Stonehenge sketch, 1834, Yale University

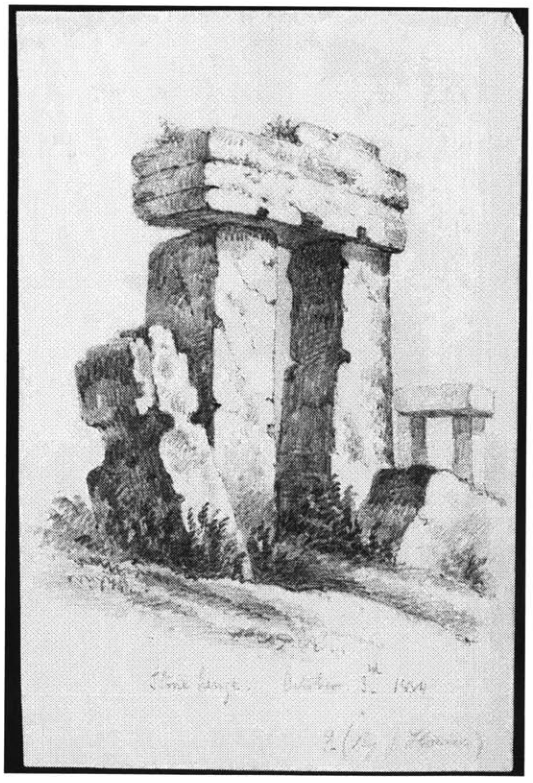
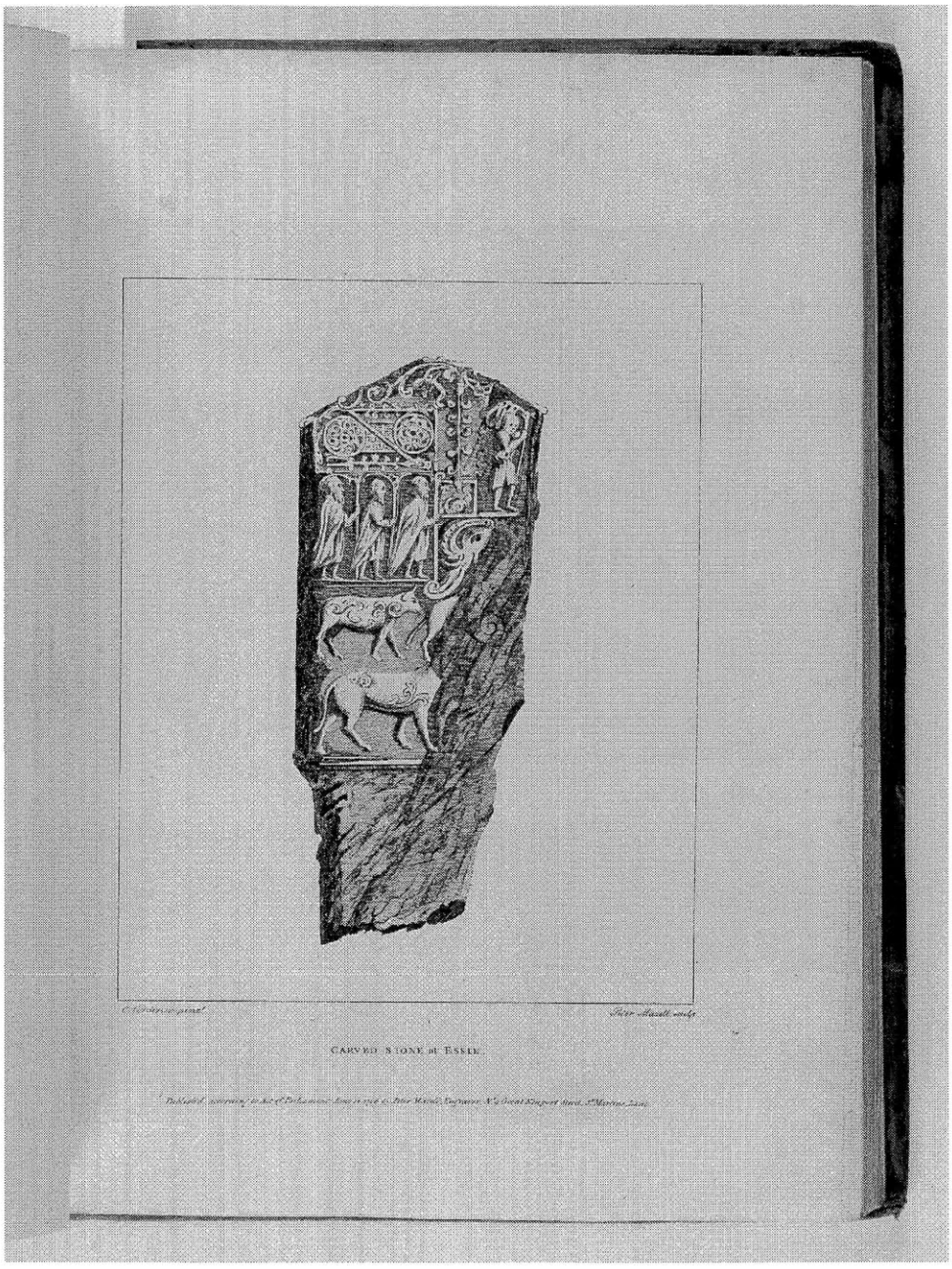


Fig. 3.12: Charles Cordiner, *Carved stone at Essie* and *Reverse of the obelisk at Essie*, Lewis Walpole Library, Yale University, Framingham



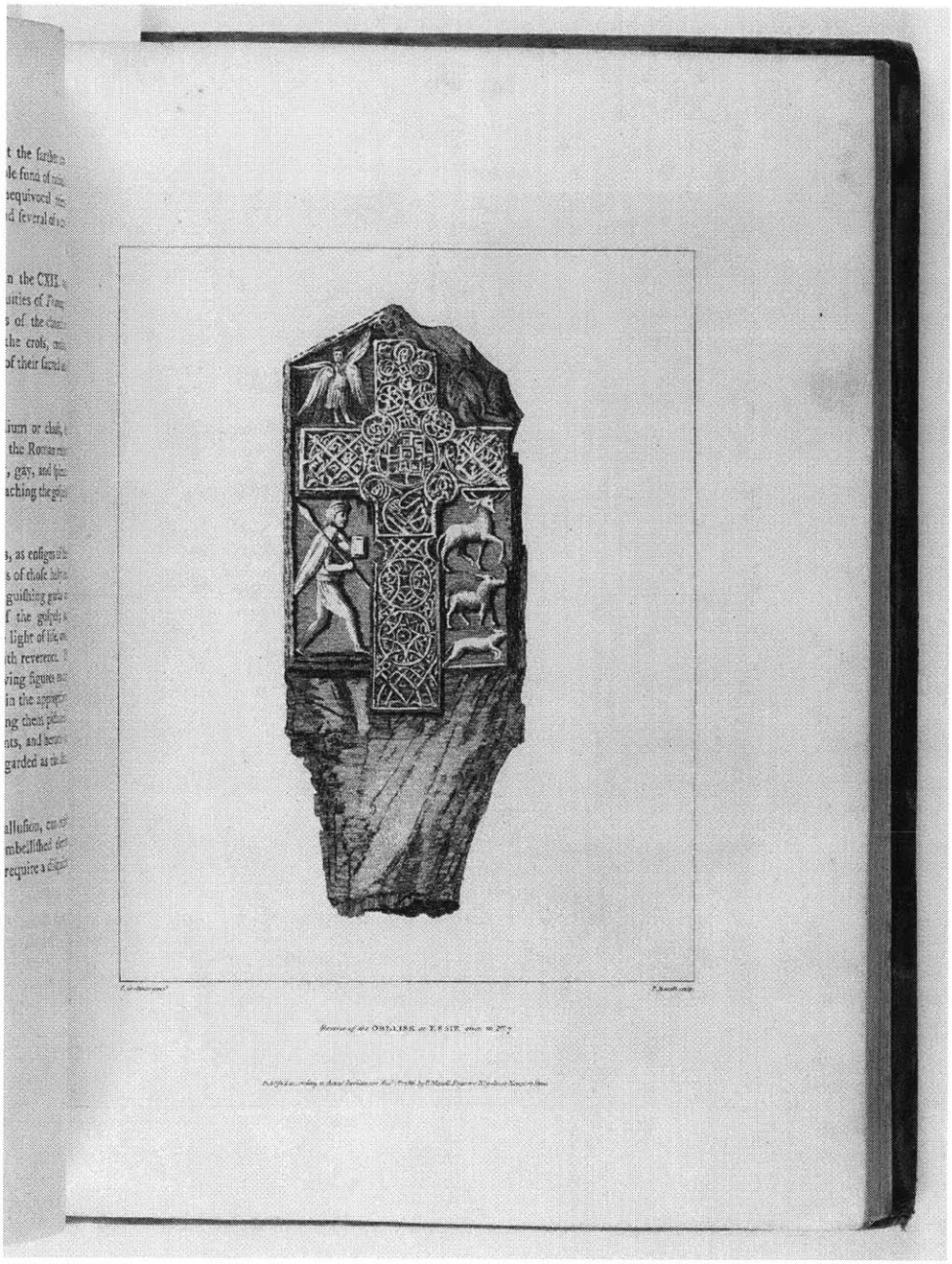
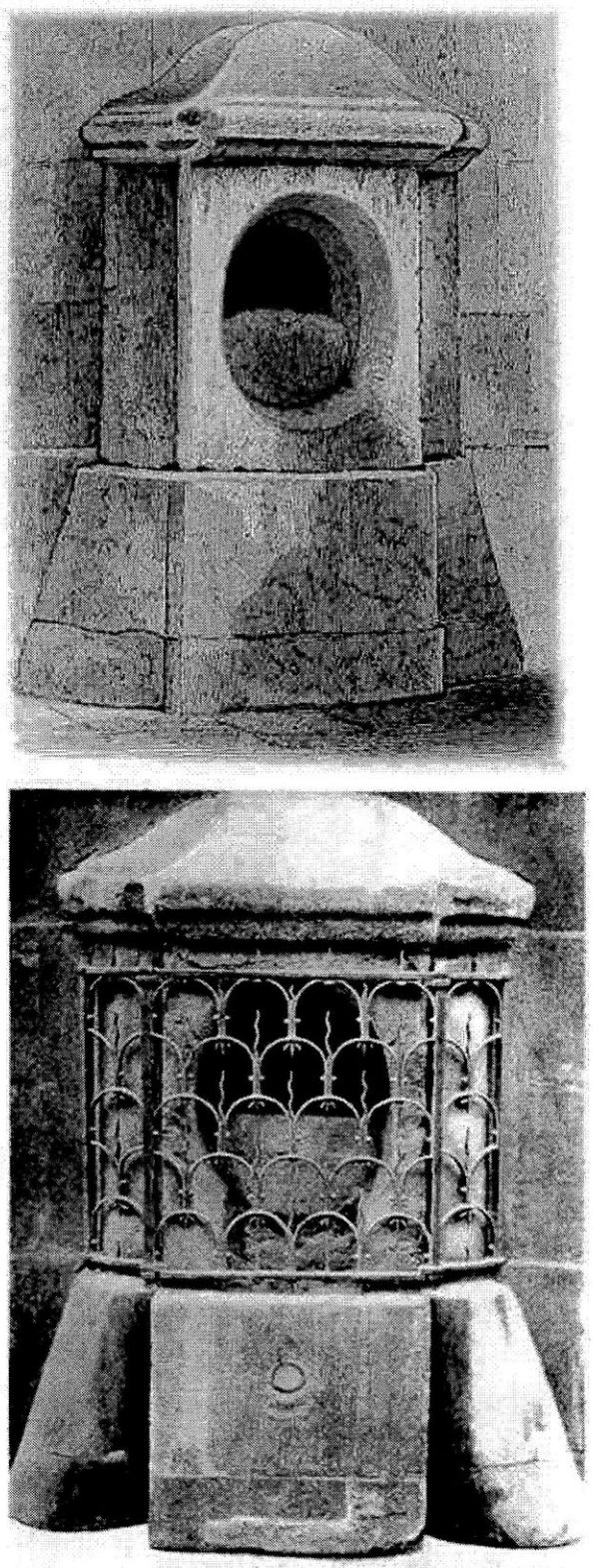
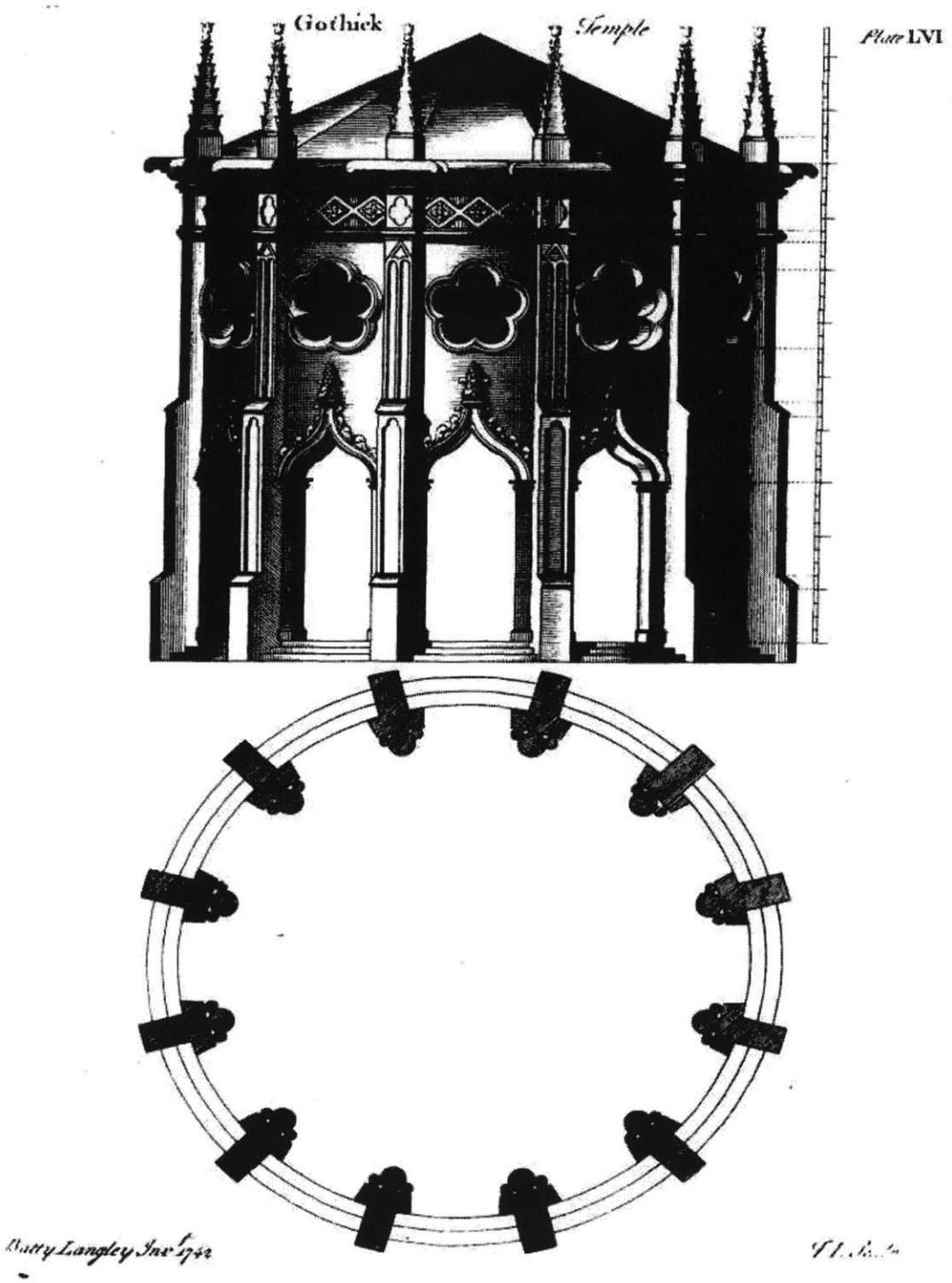


Fig. 3.13: *London Stone*, two printed illustrations, Yale Center for British Art

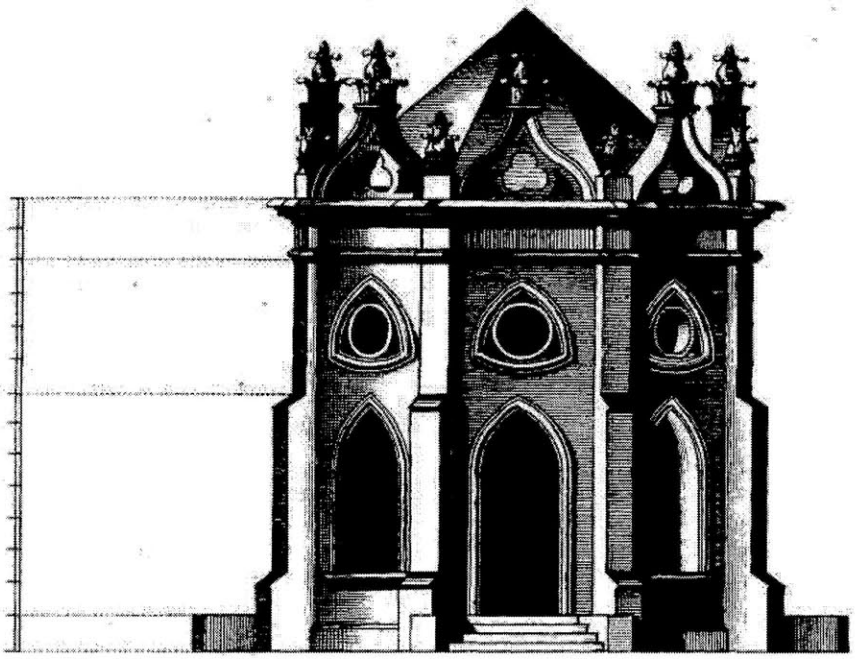


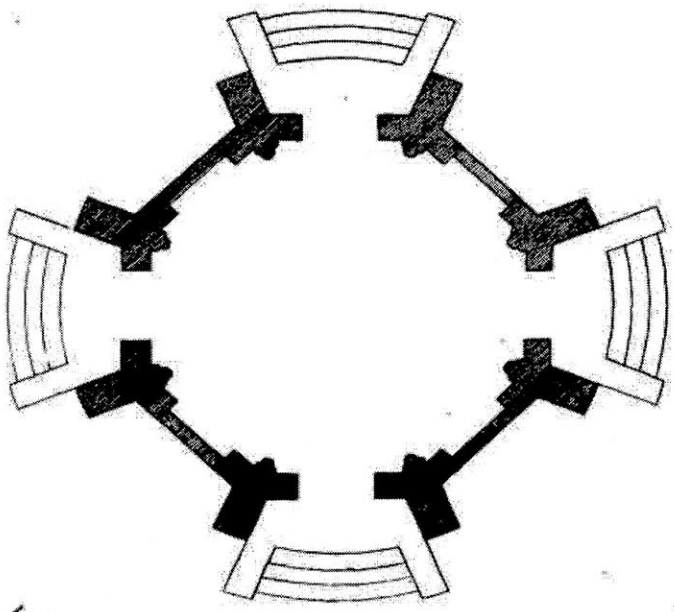
London Stone, that legend says King Brutus laid, founding the Capital, Cannon Street

Fig. 3.14: Batty Langley, Gothic temples and pavilions from *Gothic architecture, improved by rules and proportions*, 1747, Eighteenth-Century Collections Online

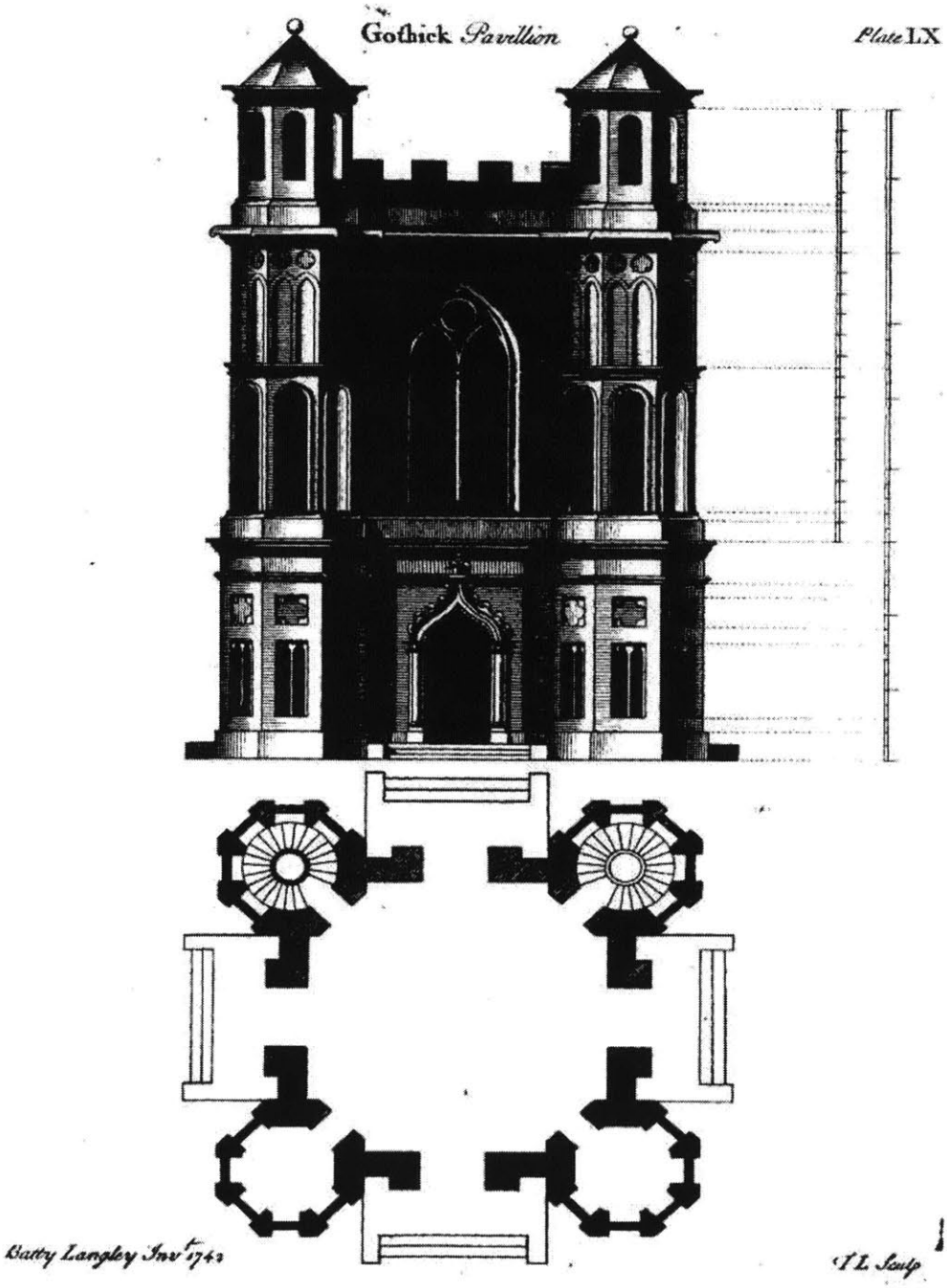


Gothick *Temple.* *Plate* LVII





*Batty Langley Inv.t 1742* *T. Langley Sculp*


Gothick Pavillion
Plate LX
Batty Langley Inv.t 1742
T.L. Sculp.

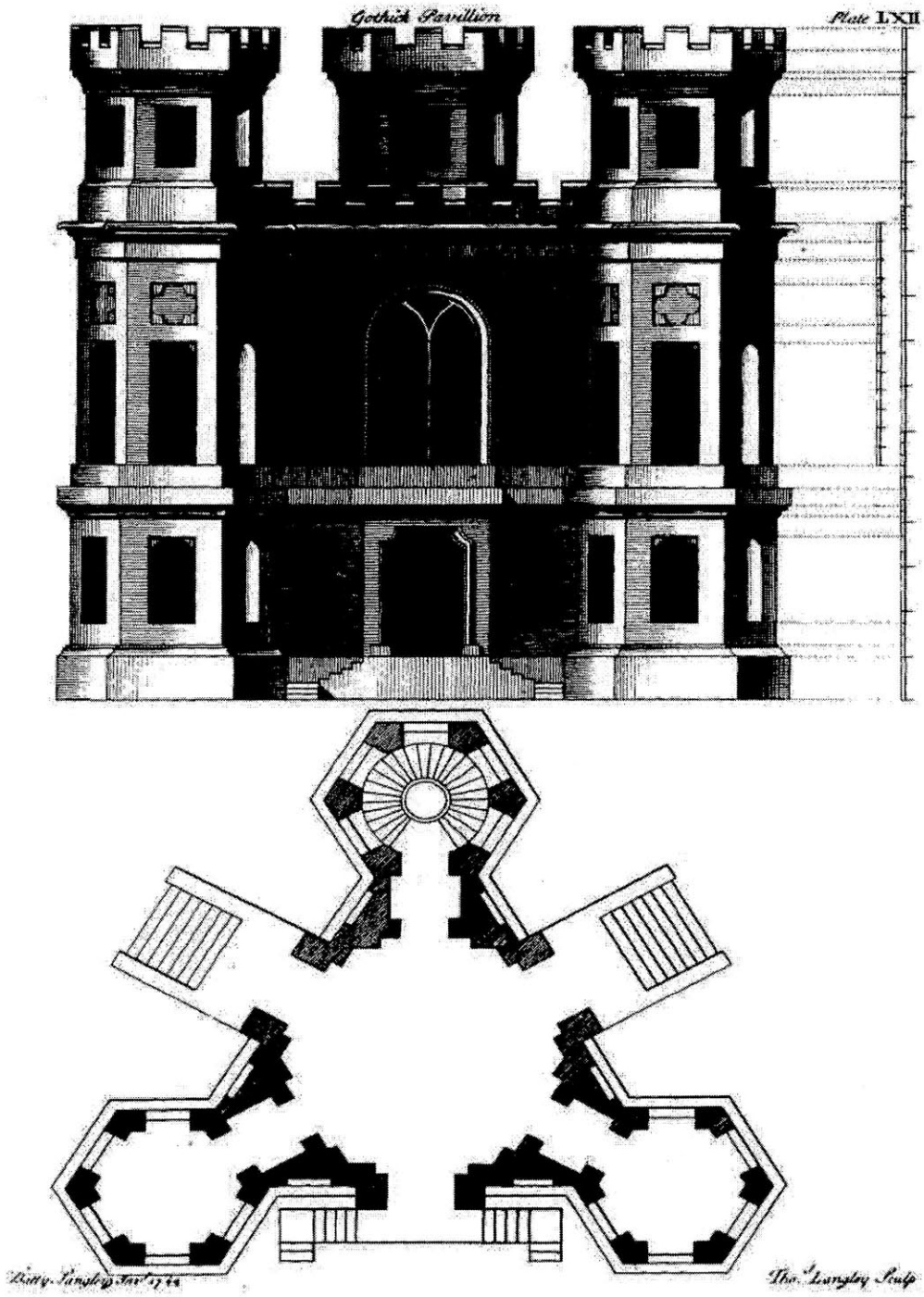
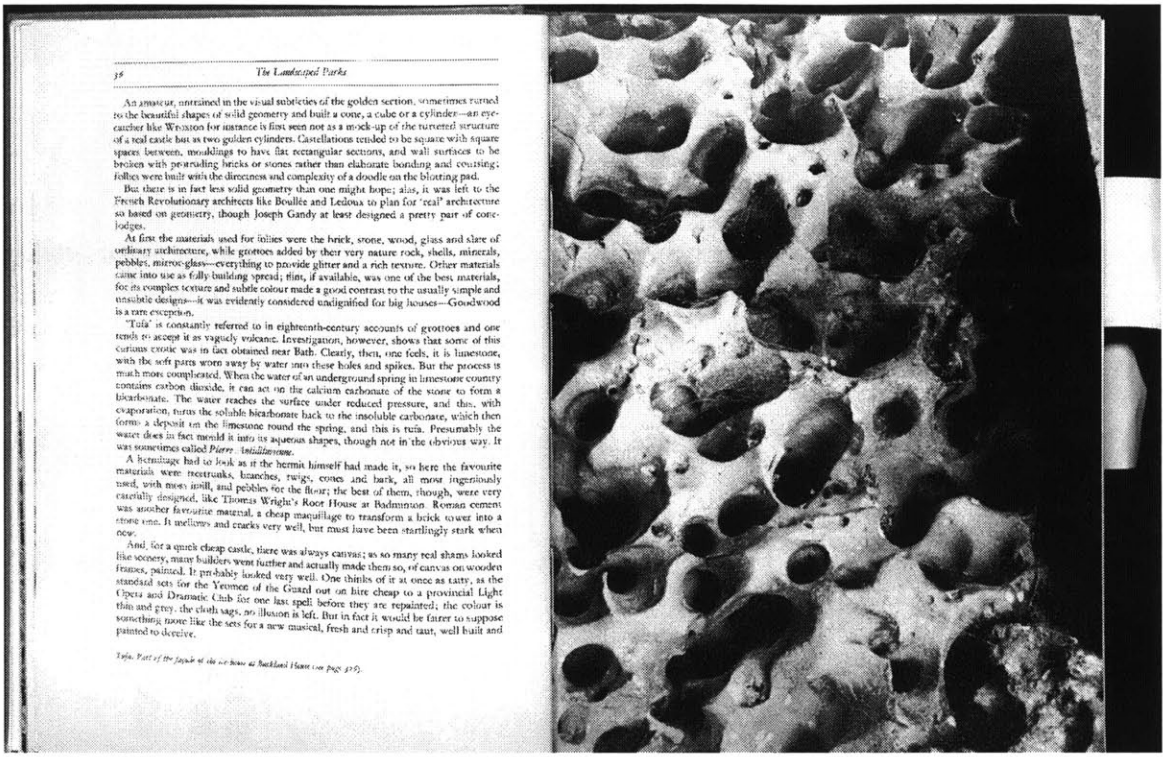

Gothick Pavillion
Plate LXII
Batty Langley Inv.t 1744
Tho.s Langley Sculp.t

Fig. 3.15: Detail of tufa stone reprinted from Barbara Jones, *Follies & Grottoes*



56 *The Landscaped Parks*

An amateur, untrained in the visual subtleties of the golden section, sometimes turned to the beautiful shapes of solid geometry and built a cone, a cube or a cylinder—an eye-catcher like Wrotton for instance is first seen not as a mock-up of the turreted structure of a real castle but as two golden cylinders. Castellations tended to be square with square spaces between, mouldings to have flat rectangular sections, and wall surfaces to be broken with protruding bricks or stones rather than elaborate bonding and coursing; follies were built with the directness and complexity of a doodle on the blotting pad.

But there is in fact less solid geometry than one might hope; alas, it was left to the French Revolutionary architects like Boullée and Ledoux to plan for 'real' architecture so based on geometry, though Joseph Gandy at least designed a pretty pair of cone-lodges.

At first the materials used for follies were the brick, stone, wood, glass and slate of ordinary architecture, while grottoes added by their very nature rock, shells, minerals, pebbles, mirror-glass—everything to provide glitter and a rich texture. Other materials came into use as folly building spread; flint, if available, was one of the best materials, for its complex texture and subtle colour made a good contrast to the usually simple and unsubtle designs—it was evidently considered undignified for big houses—Goodwood is a rare exception.

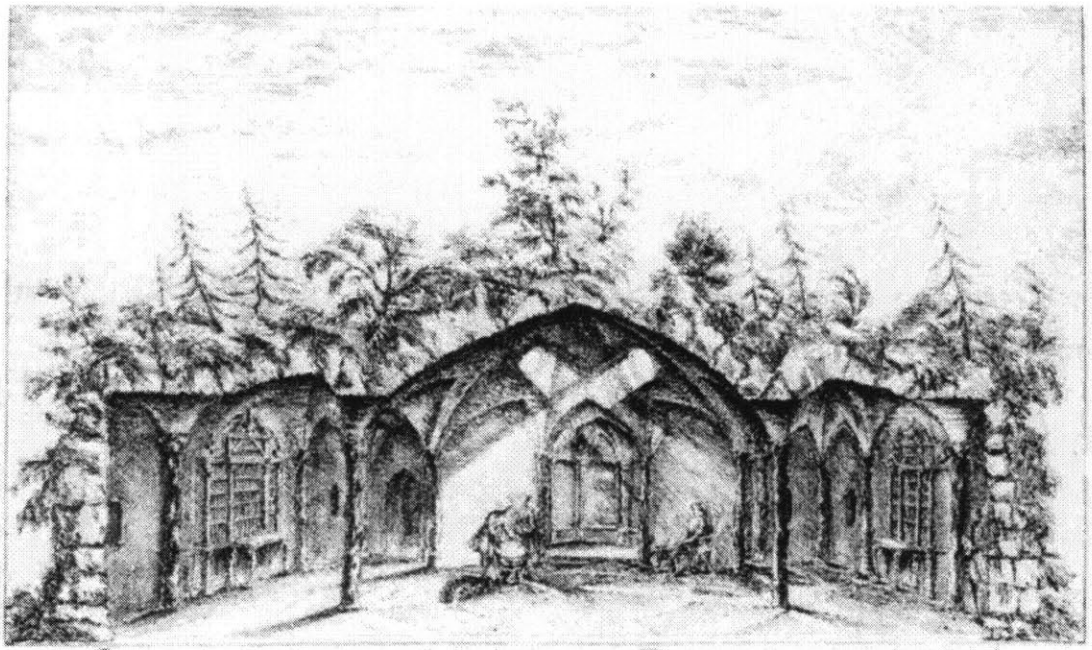
'Tufa' is constantly referred to in eighteenth-century accounts of grottoes and one tends to accept it as vaguely volcanic. Investigation, however, shows that some of this curious exotic was in fact obtained near Bath. Clearly, then, one feels, it is limestone, with the soft parts worn away by water into these holes and spikes. But the process is much more complicated. When the water of an underground spring in limestone country contains carbon dioxide, it can act on the calcium carbonate of the stone to form a bicarbonate. The water reaches the surface under reduced pressure, and then, with evaporation, turns the soluble bicarbonate back to the insoluble carbonate, which then forms a deposit on the limestone round the spring, and this is tufa. Presumably the water does in fact mould it into its aqueous shapes, though not in the obvious way. It was sometimes called *Pierre Antidiluvienne*.

A hermitage had to look as if the hermit himself had made it, so here the favourite materials were treetrunks, branches, twigs, cones and bark, all most ingeniously used, with moss infill, and pebbles for the floor; the best of them, though, were very carefully designed, like Thomas Wright's Root House at Badminton. Roman cement was another favourite material, a cheap maquillage to transform a brick tower into a stone one. It mellows and cracks very well, but must have been startlingly stark when new.

And, for a quick cheap castle, there was always canvas; as so many real shams looked like scenery, many builders went further and actually made them so, of canvas on wooden frames, painted. It probably looked very well. One thinks of it at once as tatty, as the standard sets for the Yeomen of the Guard out on hire cheap to a provincial Light Opera and Dramatic Club for one last spell before they are repainted; the colour is thin and grey, the cloth sags, no illusion is left. But in fact it would be fairer to suppose something more like the sets for a new musical, fresh and crisp and taut, well built and painted to deceive.

*Tufa. Part of the façade of the new house at Buckland House* (see page 57).

Fig. 3.16: William Kent, Merlin's Cave at Richmond, 1744



*The Section of MERLIN's CAVE in the Royal Gardens at Richmond*

Fig. 3.17: John Serle, Entryway into grotto, *Plan of Mr. Pope's garden*, reproduced by Anthony Beckles and detail photo of grotto interior today

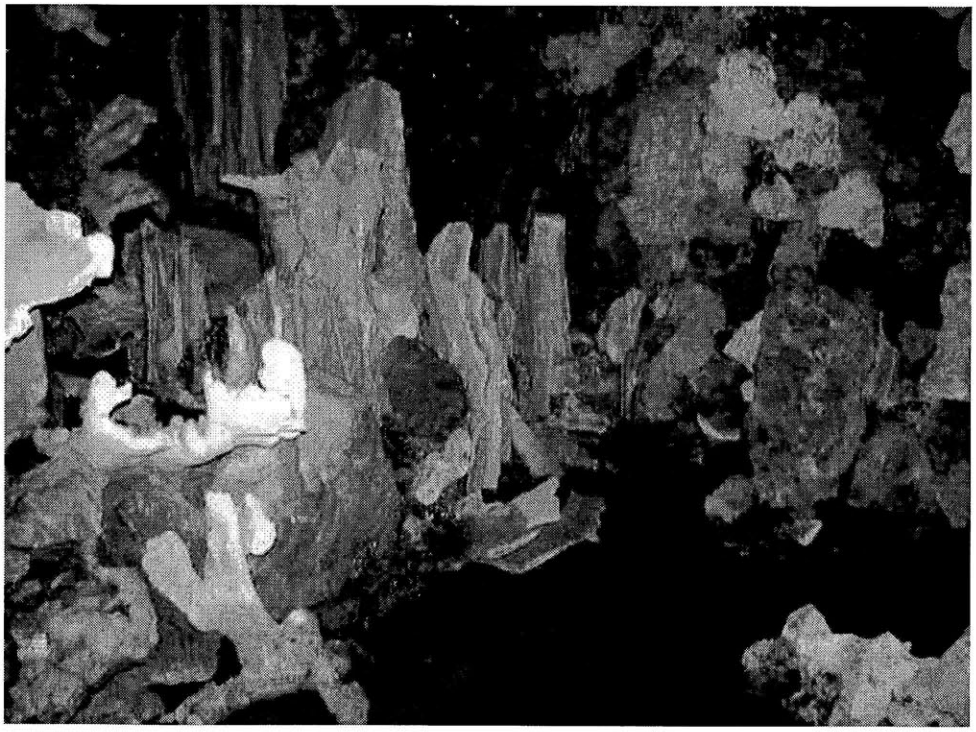
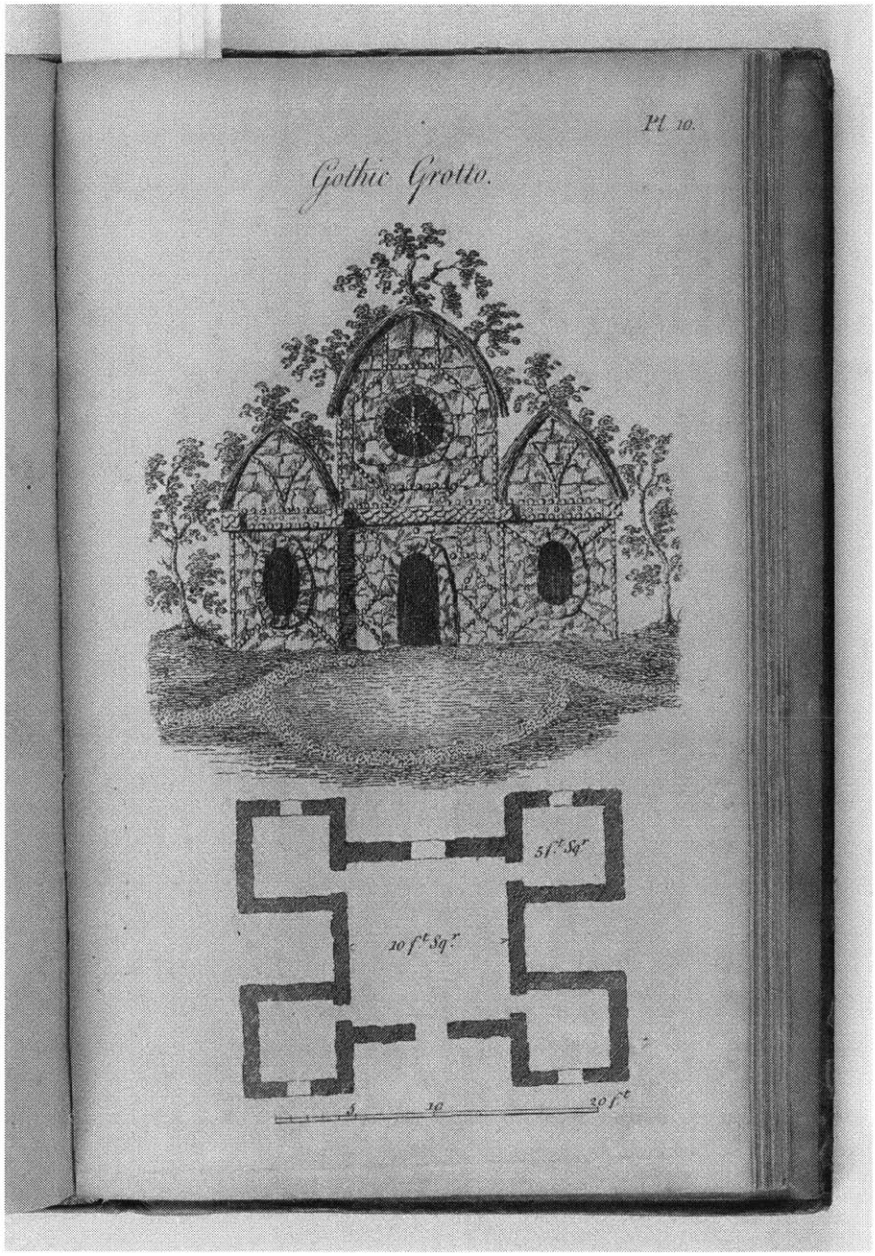
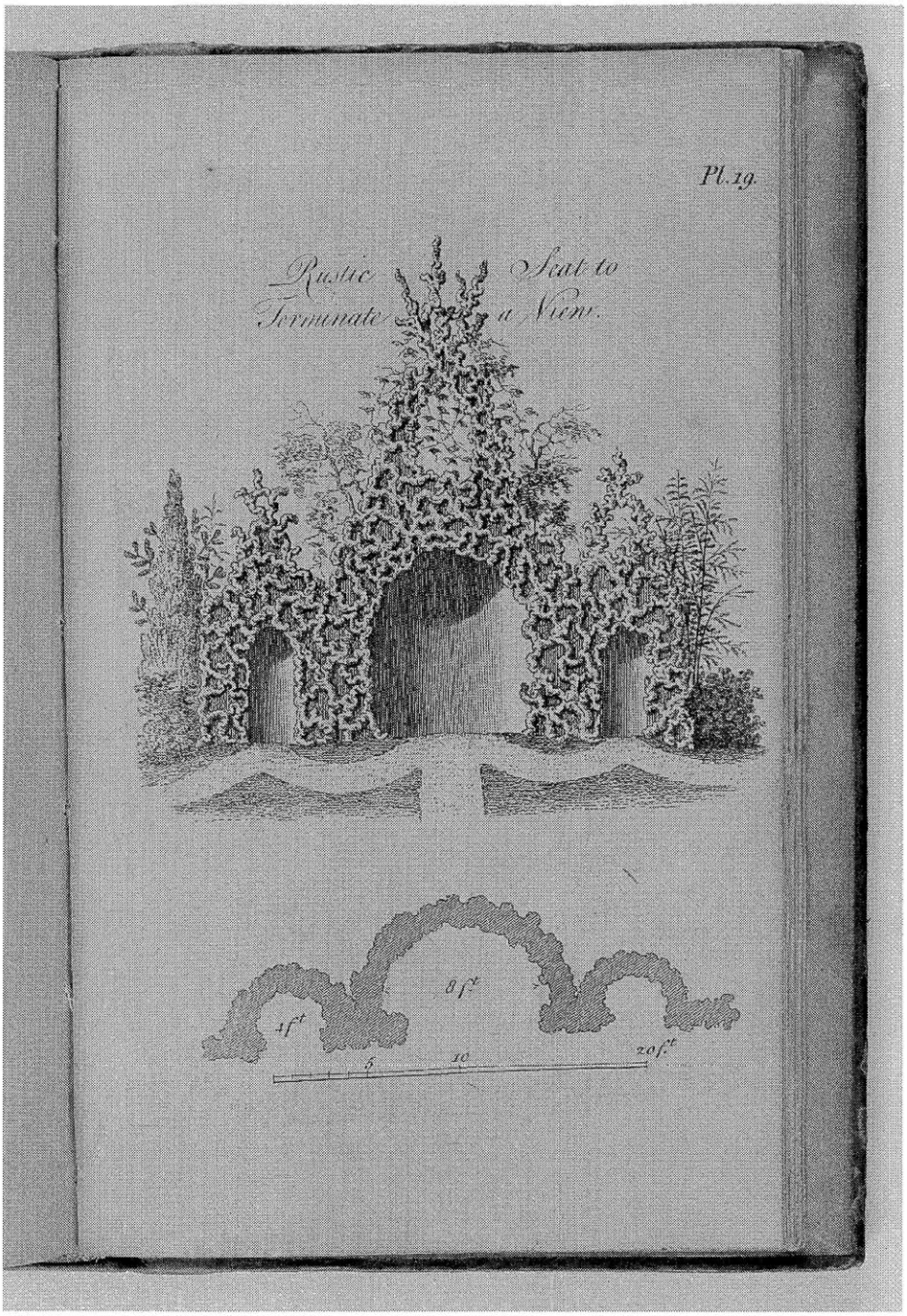
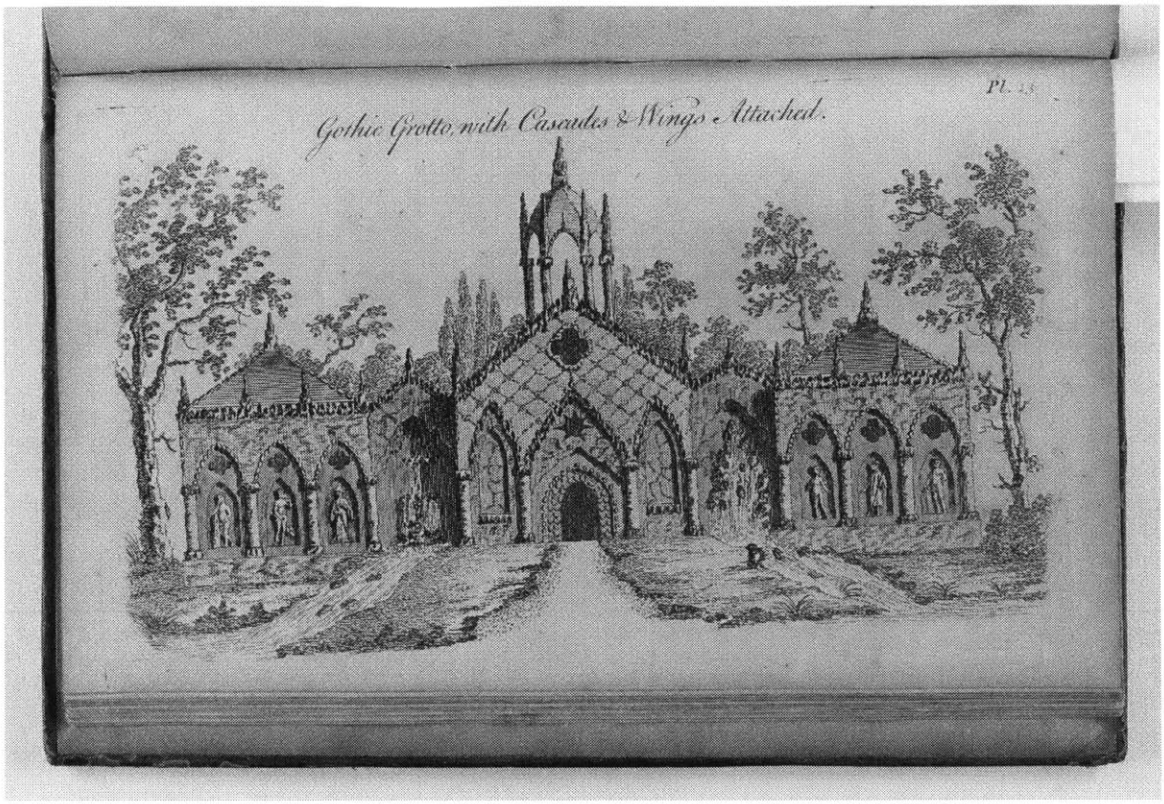


Fig. 3.18-3.20: Thomas Collins Overton, Gothic grotto; Rustic seat to terminate a view; Gothic grotto with cascades and wings; Gothic grotto with Cascades and Wings Attached; Rustic grotto; Lewis Walpole Library




Pl. 19.
Rustic Seat to
Terminate a View.
8 ft
4 ft
5
10
20 ft


Gothic Grotto with Cascades & Wings Attached.

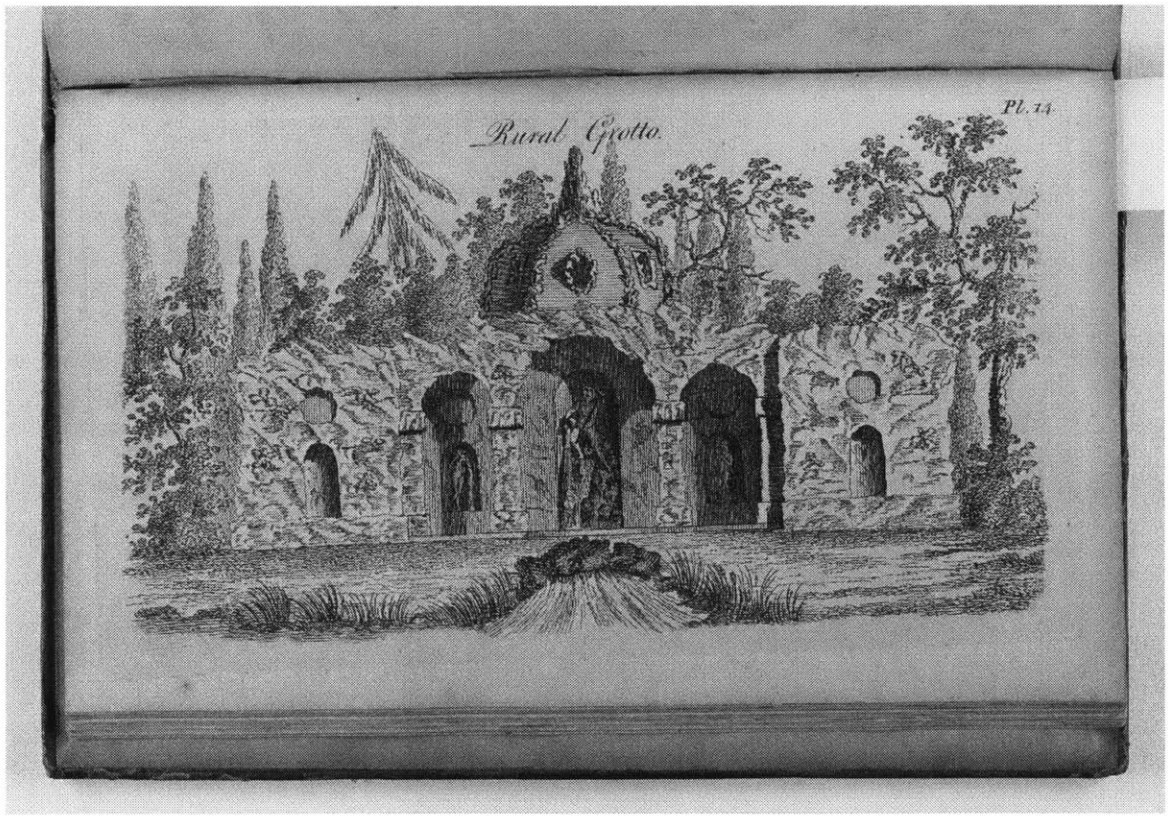

Rural Grotto.
Pl. 14

Fig. 3.21: Three-legged lewis used for lifting quarried blocks

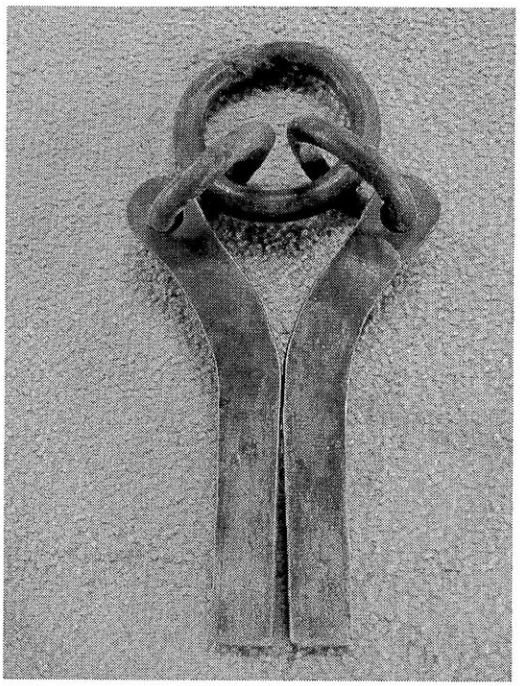


Fig. 3.22: William Hogarth, *The Sign of the Paviour*, 1725, Yale Center for British Art, New Haven

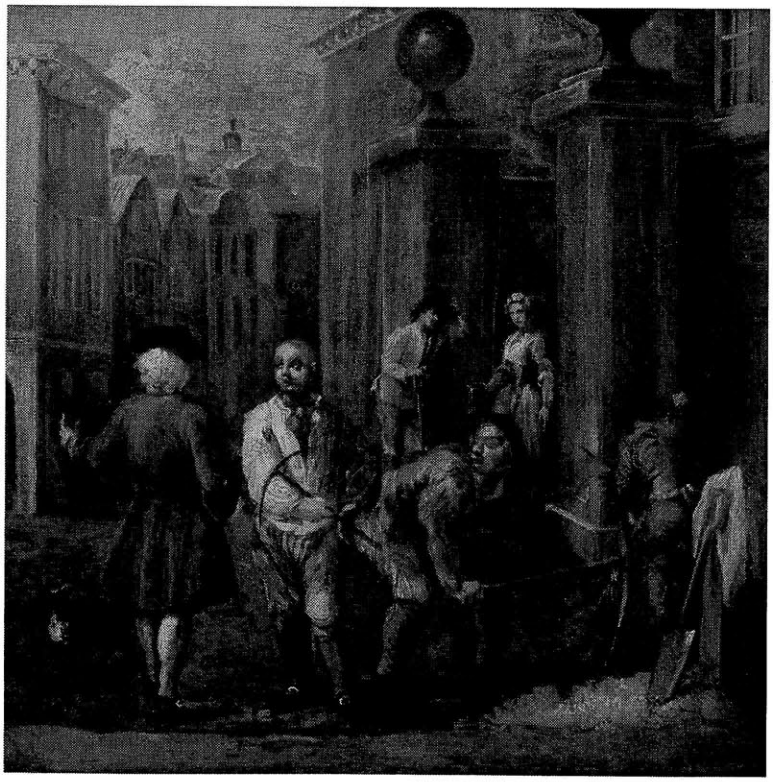


Fig. 3.23: Railways near Bath, England used to transport stone (Ralph Allen)

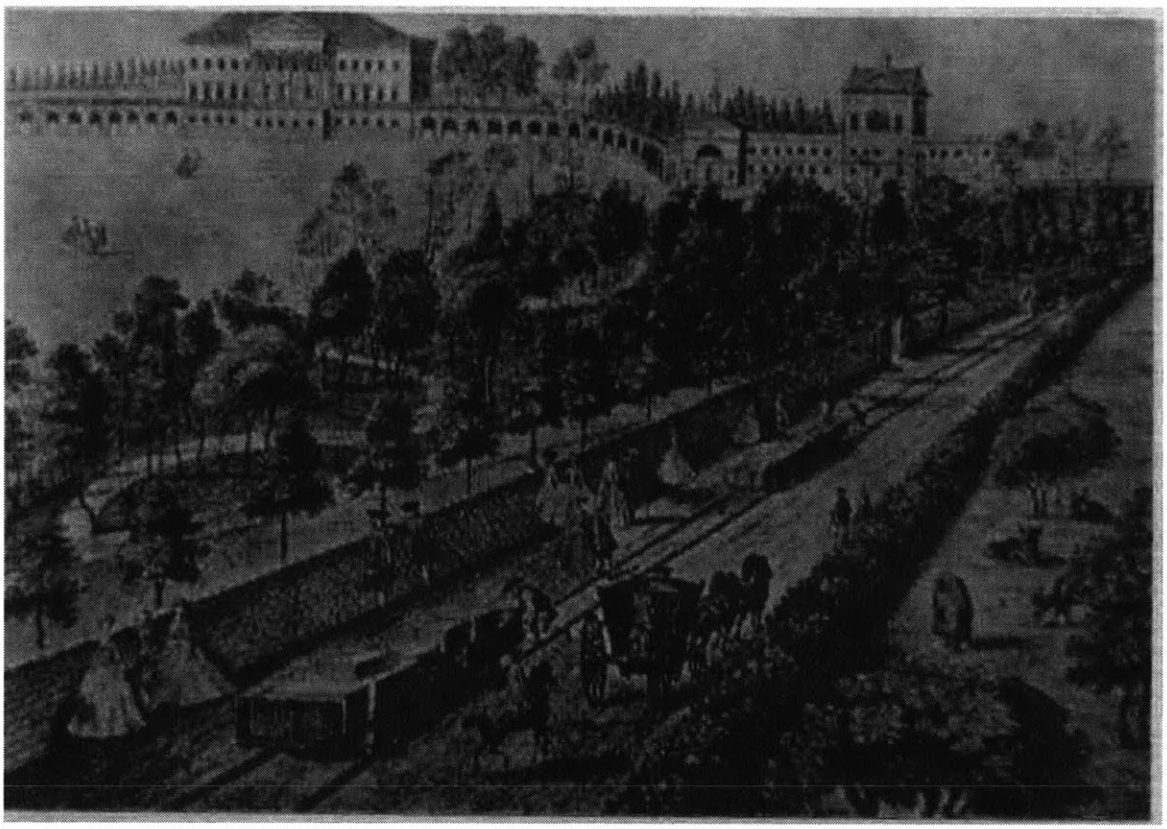


Fig. 3.24: *Londina Illustrata*, Rare Manuscripts and Books, Yale Center for British Art

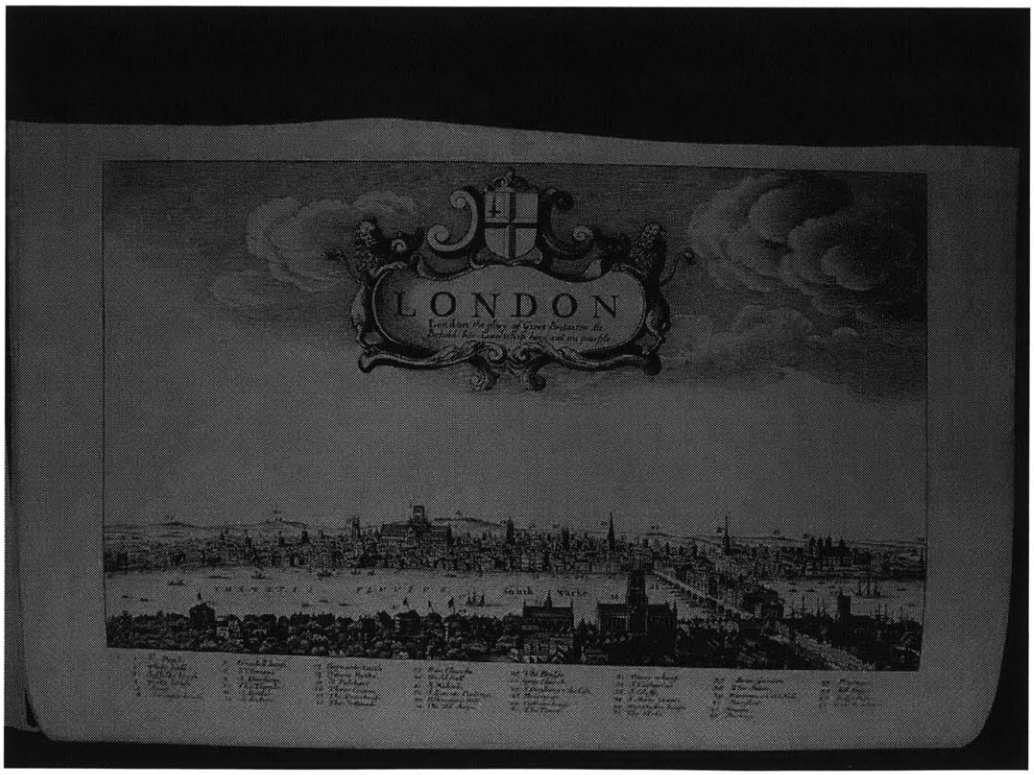
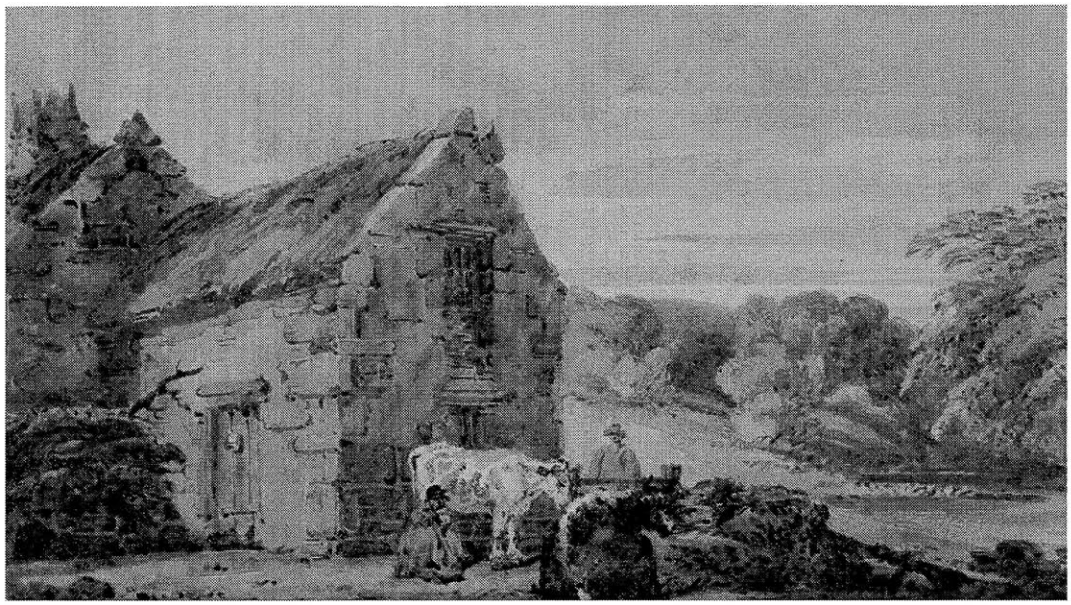


Fig. 3.25: Thomas Girtin, *Cottage near Newcastle, Northumberland*, ca. 1797, and John Sell Cotman, *Ruined House*, 1807-1810, Yale Center for British Art



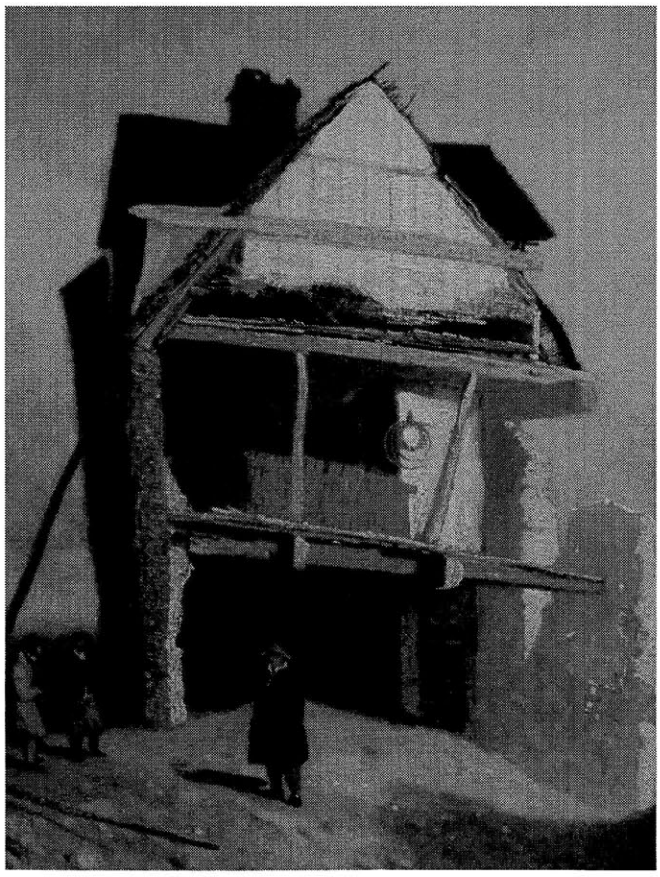
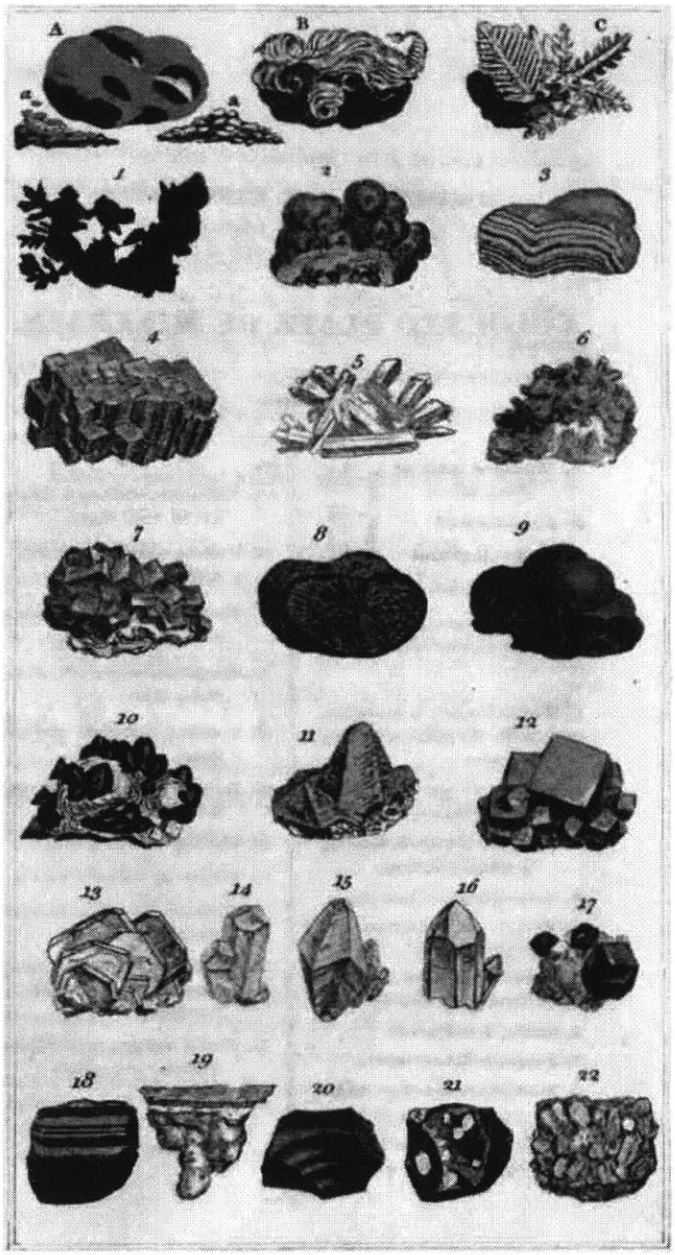
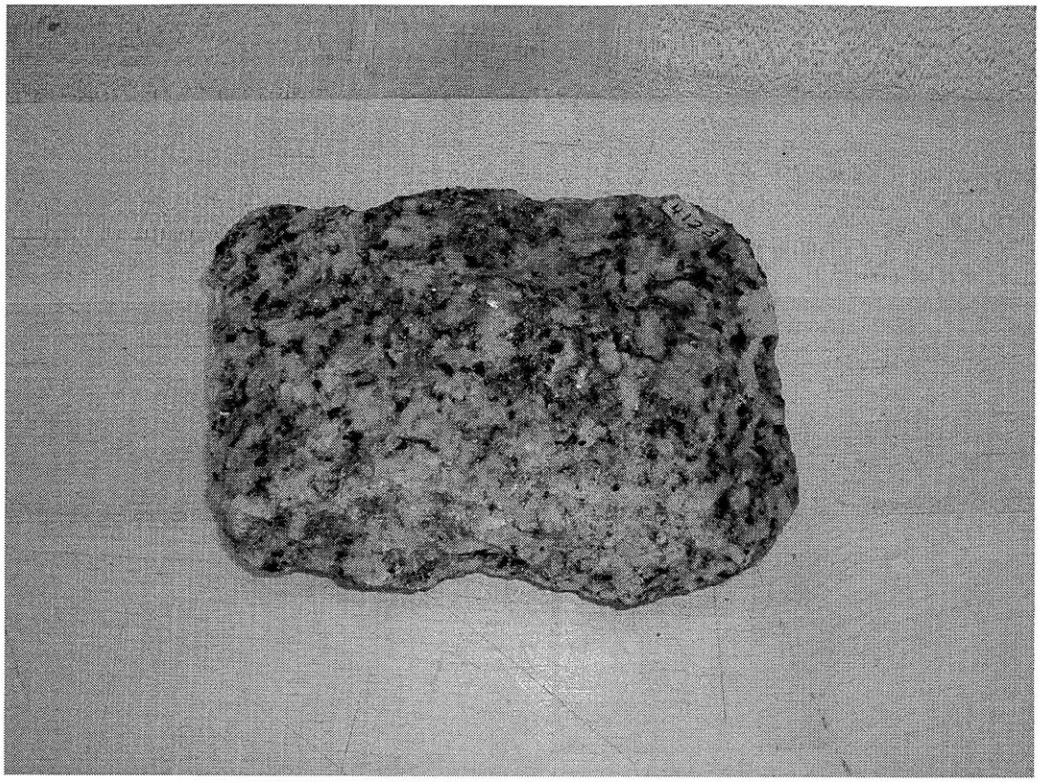
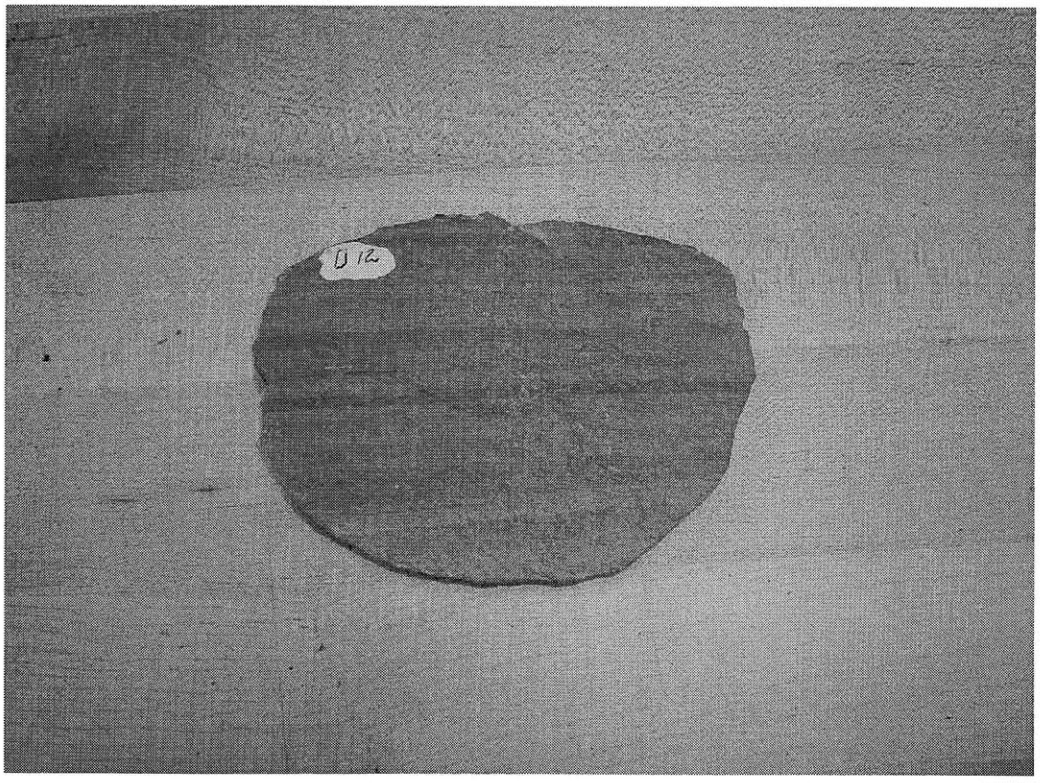
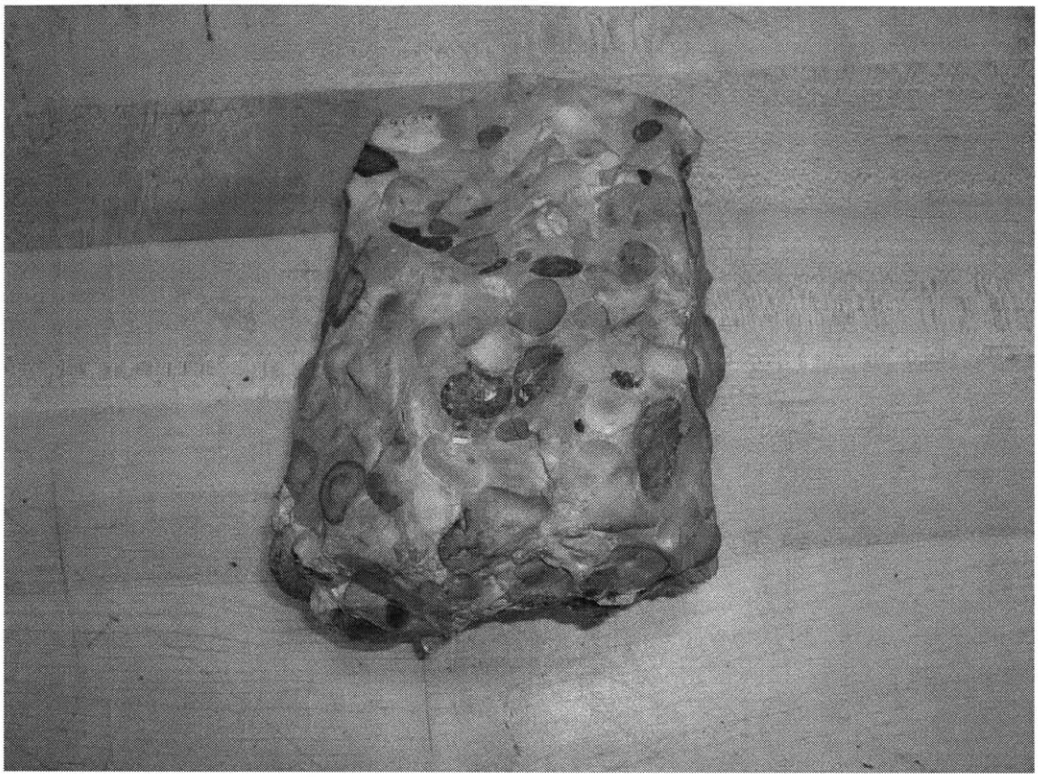


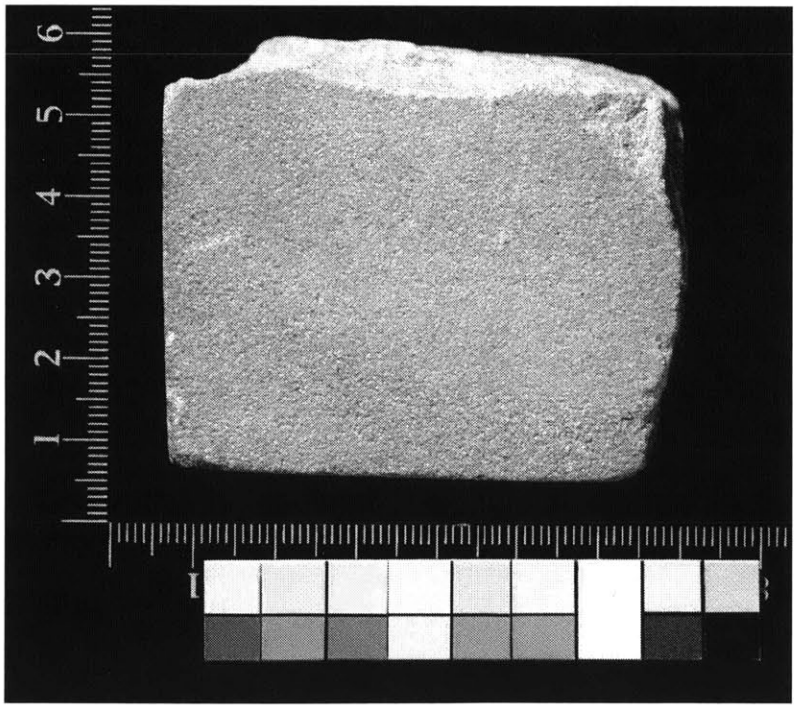
Fig. 3.26 and 3.27: James Sowerby, illustration, and British stone specimens from Peabody Museum, granite with schorl, Liskeard, Cornwall, 4123; slate from British colony, B-12; pudding stone, Radletts, Herts, England, 4139, Yale University; sandstone from Staffordshire, BM.1985 E7903, Natural History Museum, London






D 12

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2
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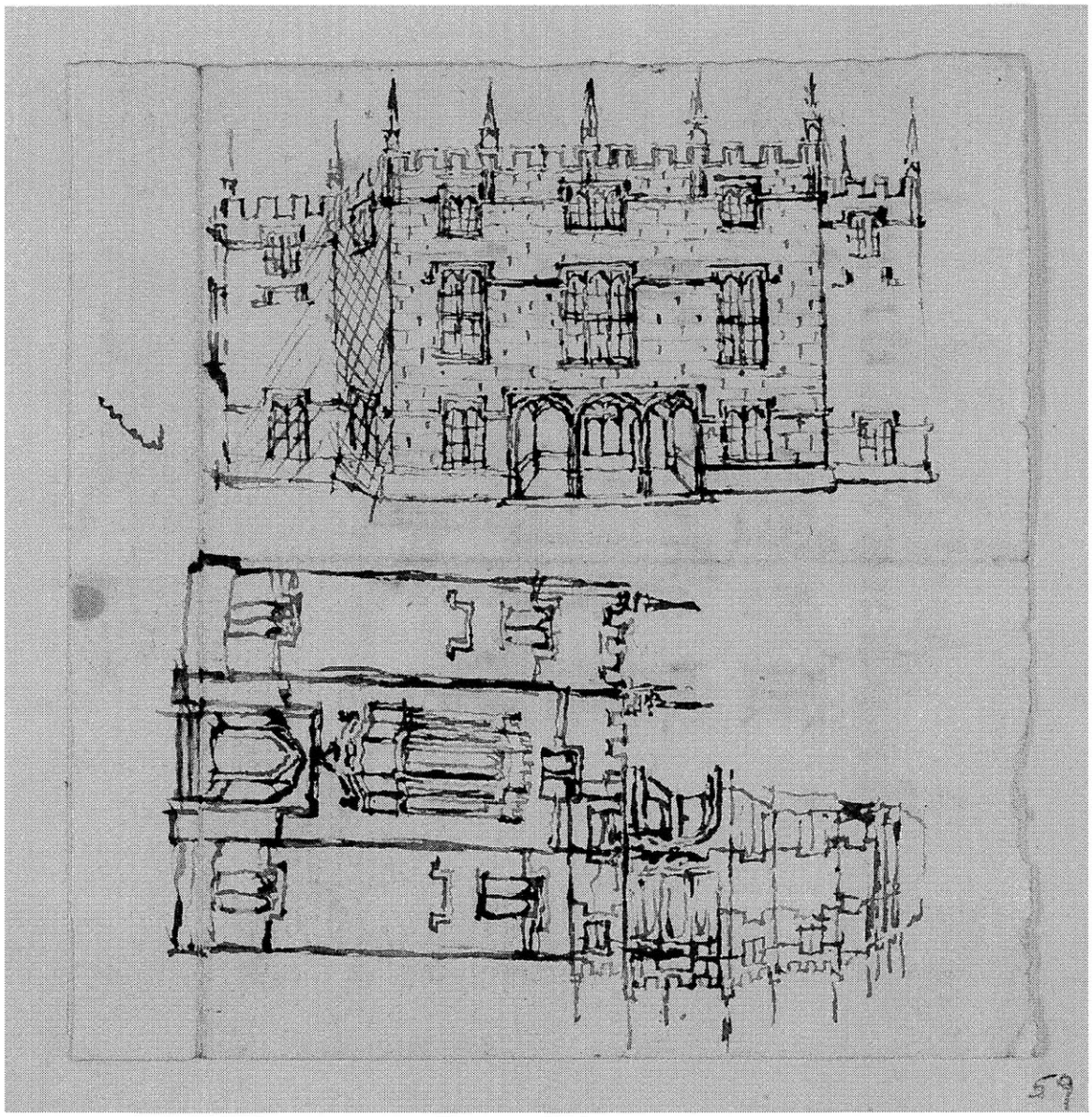
Fig. 3.28 and 3.29: Robert Adam and John Chute, Strawberry Hill drawings and sketches, Lewis Walpole Library, Yale University



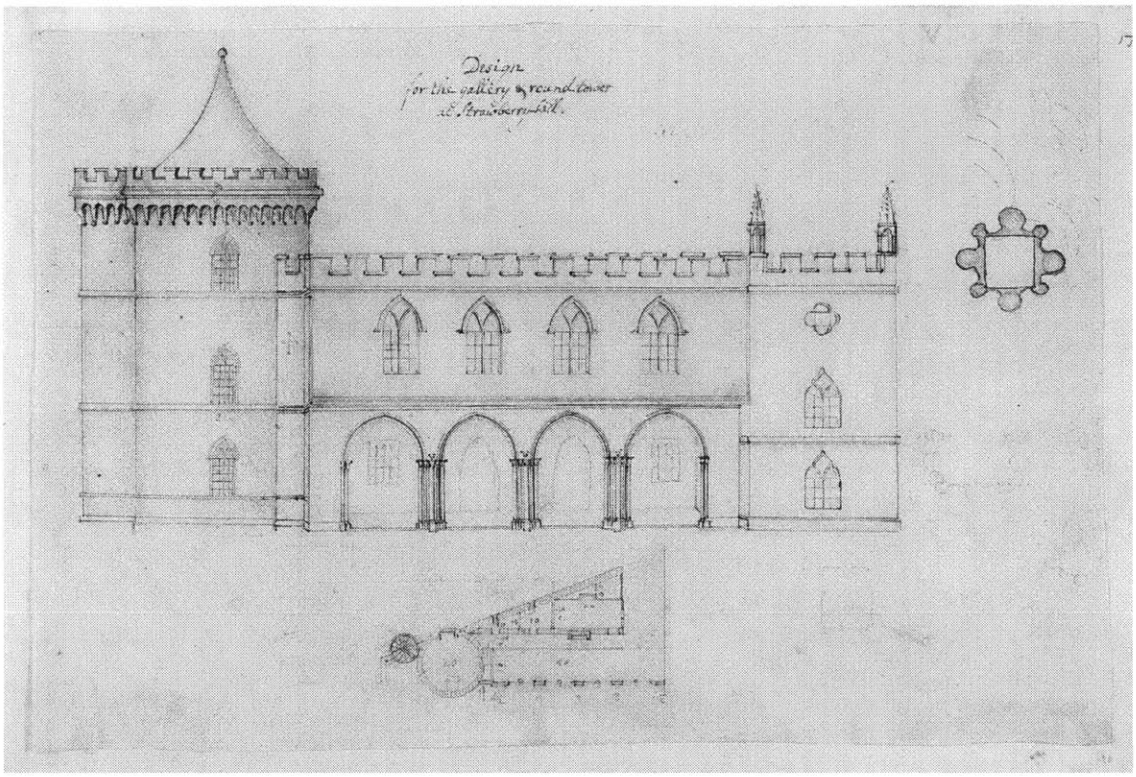



Fig. 3.30, Samuel Ware, *Remarks on Theatres; and on the propriety of Vaulting Them with Brick and Stone*, 1809, Yale Center for British Art

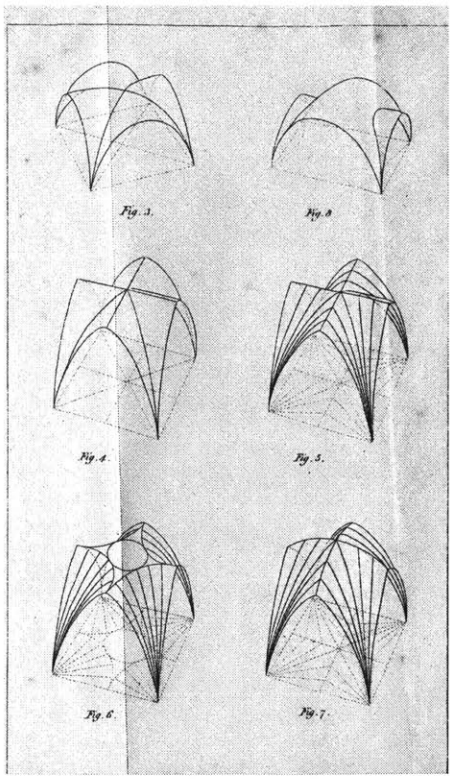
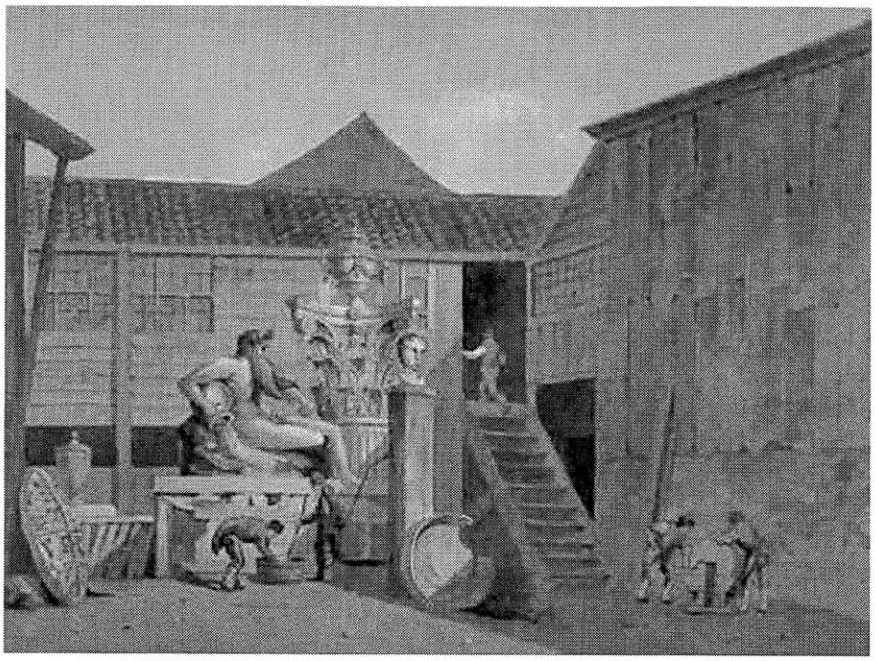
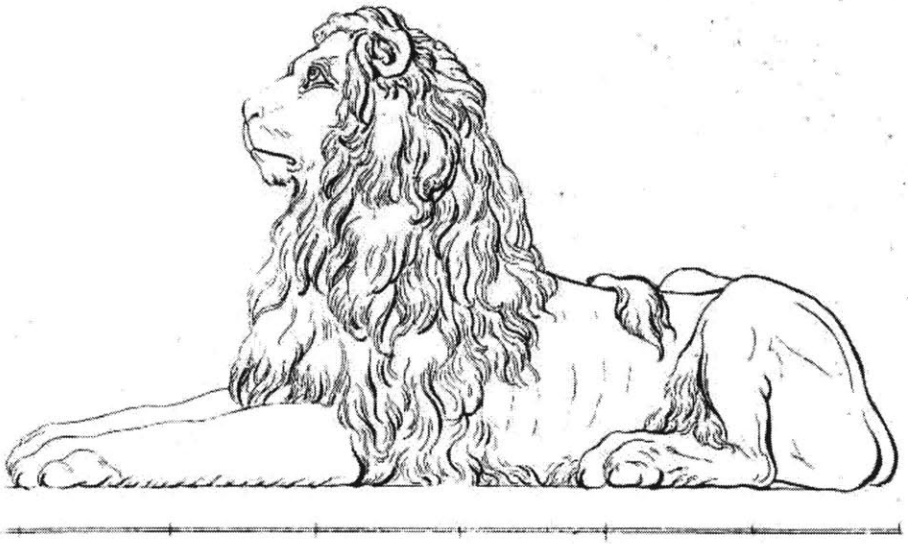


Fig. 3.31 and 3.32: Mrs. Coade's factory; lion statue made from Coade stone alongside drawing of lion ornament from Coade catalogue





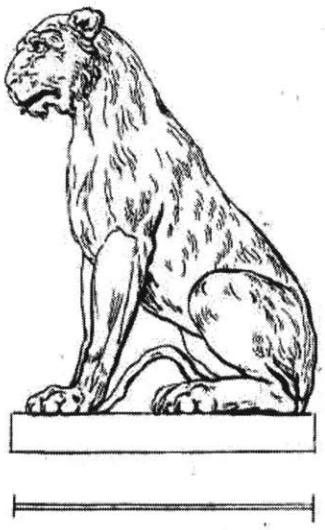
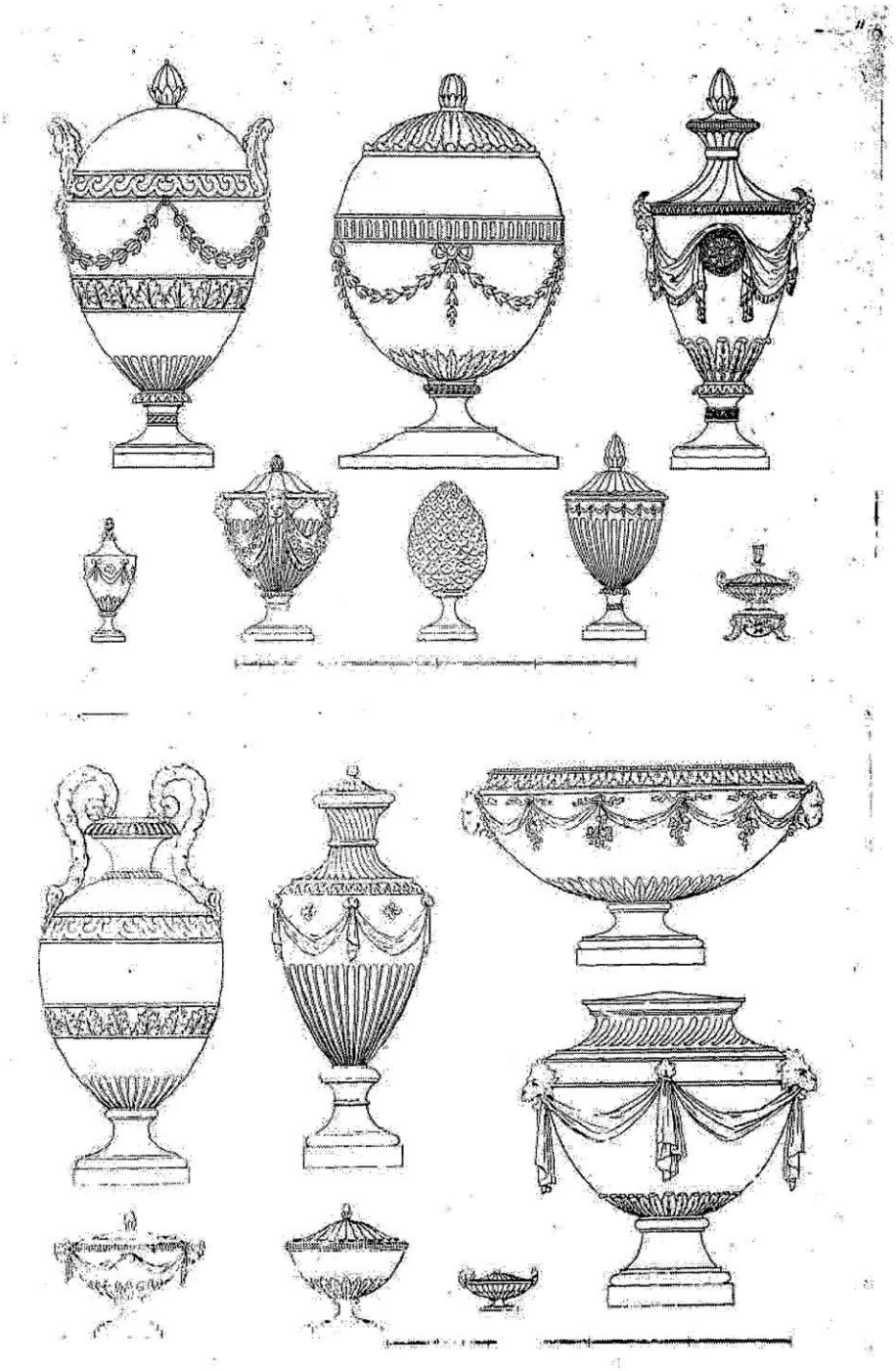
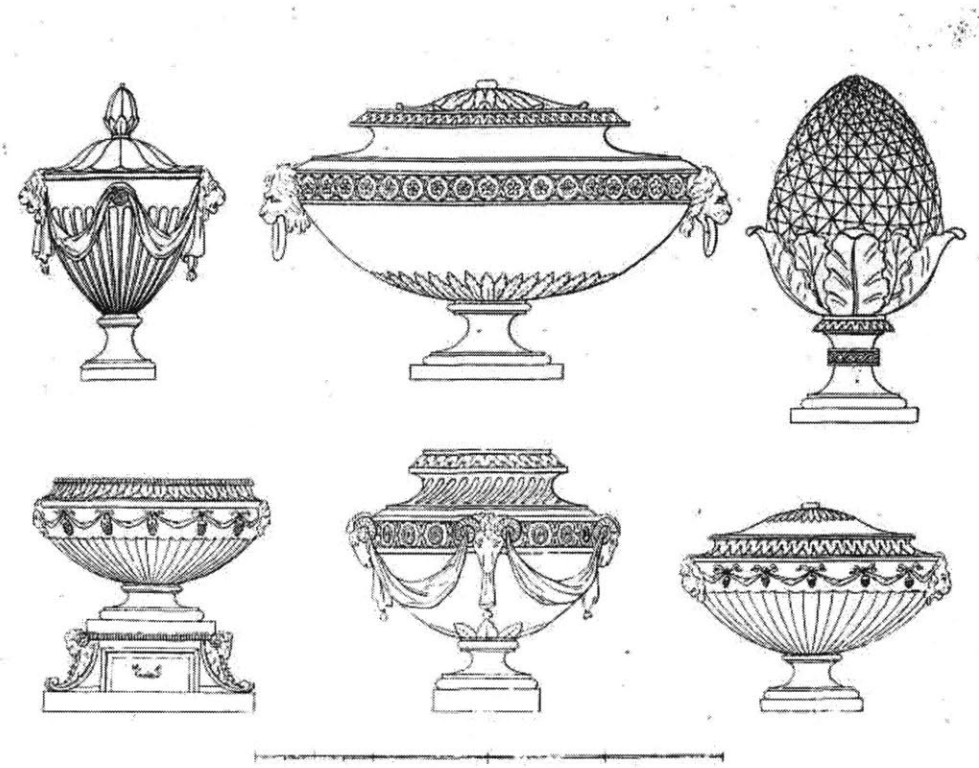
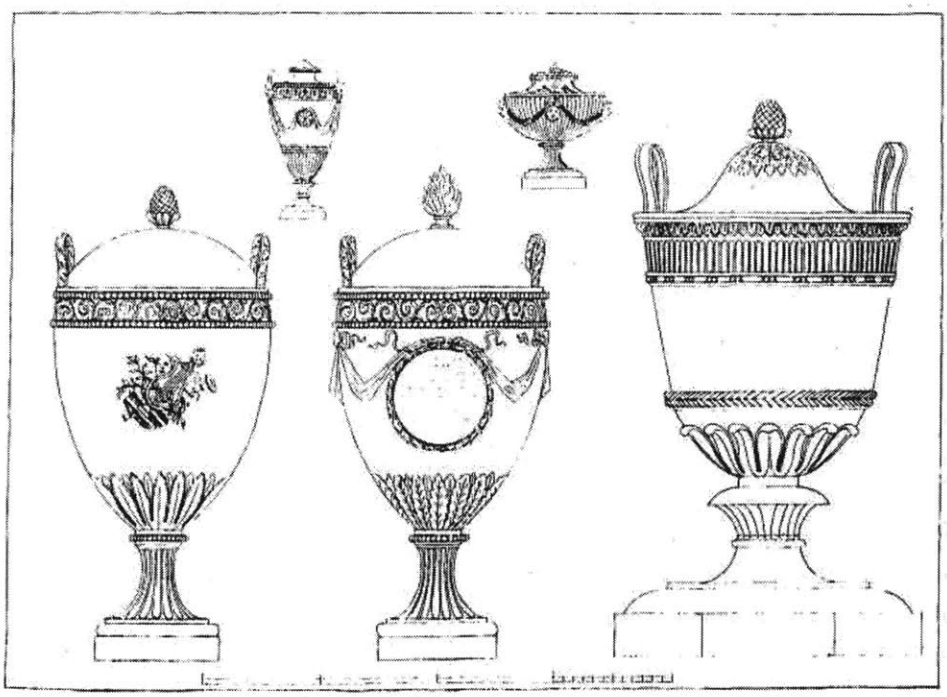


Fig. 3.33: Coade stone catalogue pages of vases and urns, Eighteenth-Century Collections Online







[1] Batty Langley, *The Builder's Chest Book; or a Complete Key to the Five Orders of Columns in Architecture* (London: Printed for J. Wilcox, 1727): 62.

[2] Thomas Whateley, "Of Buildings," *Observations on Modern Gardening* (1770).

[3] Langley, *The Builder's Chest Book,* 63-67. Langley also authored *A Sure Guide to Builders: or the Principles and Practice of Architecture* (1729); *The Young Builder's Rudiments* (1730); *The Principles of Ancient Masonry* (1733); *The Builder's Complete Assistant or a Library of Arts and Sciences* (1738); *The City and Country Builder's and Workman's Treasury of Designs* (1740-1756).

[4] Batty Langley and Thomas Langley, *The Builder's Jewel: or, The youth's instructor, and workman's remembrancer...*(London: Printed for John Rutruen, 1808): 59.

[5] Ibid., 50. Geoffrey Beard in *Craftsmen and Interior Decoration in England, 1660-1820* (1981) relates, "The name of marble is applied to all stones harden than gypsum, that are found in large masses, and are susceptible to a good polish. On this principle, under the head of marble are included many varieties of limestone, porphyry, and even granite and fine-grained basalts...The English marbles from Kent and Sussex, and in particular from Purbeck, were used in the medieval period, polished and unpolished. Those found in Derbyshire, some black, were used at Chatsworth, and John Thorp of Bakewell provided this kind of marble for squares in the hall floor at Castle Howard in 1708" (36).

[6] Anonymous (name not given by Dickins and Stanton), "Hagley Hall" in *The Gothic Revival 1720-1870: Literary Sources and Documents*, vol.1 Blood and Ghosts (The Banks, Mountfield, East Sussex: Helm, 2002) edited by Michael Charlesworth: 207.

[7] Geoffrey R. Sharpe, *Historic English Churches: A Guide to their Construction, Design and Features* (New York: I.B. Tauris, 2011): 29-33.

[8] Keith Thomas, *Man and the Natural World, Changing Attitudes in England 1500-1800* (London: Allen Lane, 1983): 20. For a greater extent of British history, see Linda Colley, *Britons: Forging the Nation, 1707-1837* (New Haven: Yale University Press, 1992); Holger Hoock, *Empires of the Imagination: Politics, War and the Arts in the British World, 1750-1850* (London: Profile Books, 2010); Jean André Rouquet, *The Present State of the Arts in England* (London: J. Nourse, 1755).

[9] William Gilpin, "A Dialogue upon the Gardens of the Rt. Hon. the Lord Viscount Cobham at Stowe in Buckinghamshire" in *The Gothic Revival 1720*-1870, ed. Michael Charlesworth (Robertsbridge, UK: Helm Information, 2002): 174.

[10] James Stevens Curl, *Georgian Architecture* (Exeter: David and Charles, 1993): 16.

[11] Elizabeth Barton Rogers, Elizabeth S. Eustis, and John Bidwell, eds., *Romantic Gardens: Nature, Art, and Landscape Design* (New York: The Morgan Library and Museum, 2010): 15. Refer to Joseph Addison, "Pleasures of the Imagination" in *Spectator*, No. 411 (June 21, 1712).

[12] Ian Whyte, *Landscape and History since 1500* (London: Reaktion Books, 2002): 113-114. For treatment on British art and politics, see Tim Barringer, Geoff Quilley, and Douglas Fordham, eds., *Art and the British Empire* (Manchester: Manchester University Press, 2007); Douglas Fordham, *British Art and the Seven Years' War: Allegiance and Autonomy* (Philadelphia: University of Pennsylvania Press, 2010); Robert Hoozee, ed. with introductory essays by John Gage and Timothy Hyman, *British Vision: Observation and Imagination in British Art, 1750-1950* (Ghent: Museum voor Schone Kunsten, 2007).

[13] William Stukeley, *Ground Plot of Avebury* (1724), owned by the Society of Antiquaries of London and on display at the exhibition "Making History: Antiquaries in Britain" at Boston College's McMullen Museum in 2011.

[14] Celina Fox, *The Arts of Industry in the Age of Enlightenment* (New Haven: Yale University Press, 2009): 77. See chapter II "Drawing: Surveying the Scene, Engineering the Machine," p.45-133. Refer also to Sarah Bendall, Francis Steer, and Peter Eden, *Dictionary of Land Surveyors and Local Map-makers of Great Britain and Ireland, 1530-1850*, 2nd edition, 2 vols. (London: British Library, 1997) and Margaret Jacob, *Scientific Culture and the Making of the Industrial West* (Oxford: Oxford University Press, 1997).

[15] Ian D. Rotherham and David McCallam, "Peat Bogs, Marshes and Fen as Disputed Landscapes in Late Eighteenth-Century France and England" in *Histoires de Terre: Earth Sciences and French Culture 1740-1940*, edited by Louise Lyle and David McCallam (New York: Rodopi, 2008): 75-88, 79.

[16] Ibid., 45. Refer also to William John Conybeare and William Phillips, *Outlines of the geology of England and Wales: with an introductory compendium of the general principles of that science, and comparative views of the structure of foreign countries* (London: William Phillips, 1822).

[17] Charles Barry, Henri de la Beche, William Smith, and C.H. Smith, *Report on the Selection of Stone for Building the New Houses of Parliament* (1839). See John Phillips, *Manual of geology: practical and theoretical* (London: Richard Griffin and Co., 1855), and Phillips, *Illustrations of the geology of Yorkshire, or, A description of the strata and organic remains of the Yorkshire coast: accompanied by a geological map, sections, and plates of the fossil plants and animals* (York: Printed for the author, 1829-

1836) 2 vol. *Notice of rocks and fossils in the University Museum, Oxford* (Oxford: John Henry and James Parker, 1863).

[18] Graham Lott, "The development of the Victorian stone industry" in Peter Doyle, Terry Hughes, Ian Thomas, (eds.) *England's Heritage in Stone: proceedings of a conference : Tempest Anderson Hall, York, 15-17 March, 2005.* Folkestone, UK, English Stone Forum, 44-56.

[19] Nathaniel and Samuel Buck, *Views of the Ruins of Castles and Abbeys in England and Wales* (London: the authors, 1726). Refer to their *Proposals for publishing by subscription, twenty four perspective views of the present state of the most noted abbies, religious foundations, castles, and other remains of antiquity, in Norfolk, Suffolk, and Essex* (London: 1737); Samuel Buck, *Antiquities historical, architectural, chorographical and itinerary, in Nottinghamshire and other counties: comprising the histories of Southwell (the Ad Pontem) and of Newark (the Sidnacester, of the Romans)* (Newark: 1801-1819); Ralph Hyde, ed., *Prospect of Britain: the town panoramas of Samuel and Nathaniel Buck* (1994).

[20] On images of Welsh mines and landscape, John 'Warwick' Smith, *Junction of the Mona and Parys Mountain Copper Mines* (1790) from the National Museum of Wales and John Ingleby, Llyn-y-Pandy [Rhydalyn], or the Black Valley,...between Ruthin and Mold, 1796.

[21] Lott, 46. Stone samples from this survey were deposited in the Economic Minerals Collection of the GSGB and formed the basis of what has become the largest collection of building stones in the country, numbering more than 13,000 specimens.

[22] Gideon Algernon Mantell, *The Wonders of Geology; or, A Familiar Exposition of Geological Phenomena; being the substance of a course of lectures delivered at Brighton* (London: Relfe & Fletcher, 1840): 469-470.

[23] Ibid., 608.

[24] Rosemary Sweet, *Antiquaries: The Discovery of the Past in Eighteenth-Century Britain* (London and New York: Hambledon, 2004): 8, footnote on p.354.

[25] Ibid., 26.

[26] Thomas Richard Underwood, Drawing of pointed handaxe, Hoxne, England (1797), watercolor on paper, owned by Society of Antiquarians of London in exhibition *Making History: Antiquaries in Britain*, McMullen Museum, Boston College.

[27] For more on Richard Payne Knight, see Bruce Redford, *Dilettanti: The Antic and the Antique in Eighteenth-Century England* (Los Angeles: J. Paul Getty Museum,

2008) and "Making History: Antiquaries in Britain, 1707-2007" exhibition at McMullen Museum of Art at Boston College opening in September 2011.

[28] On Langley's treatise *New Principles of Gardening: Or, the Laying Out and Planting Parterres, Groves, Wildernesses, Labyrinths, Avenues, Parks, and After a more Grand and Rural Manner that has been done before* (1728), see David Watkins, "Built Ruins: The Hermitage as Retreat" in *Visions of Ruin: Architectural fantasies and designs for garden follies* (London: Sir John Soane's Museum, 1999): 5-14, plates 19, 21.

[29] Marjorie Swann, *Curiosities and Texts: The Culture of Collecting in Early Modern England* (Philadelphia: University of Pennsylvania Press, 2001). See chapter "Curiosities as Texts, The Countryside as Collection: Chorography, Antiquarianism, and the Politics of Landscape," p.97-148. Refer to Francis Grose, *Antiquities of England and Wales (1772-1776)*; Richard Godfrey's periodical, *Antiquarian Repertory* (1775); and Thomas Hearne and William Byrne, *The Antiquities of Great Britain* (1778-1786).

[30] John Webb, *A Vindication of Stone-Heng Restored*, 2nd edition (London: G. Conyers, 1725 [1665]). William Stukeley, *Stonehenge: A Temple Restored to the Druids* (1740) in collections of University of Leicester.

[31] Paul Fourdrinier after Thomas Wright, *Dundugan Fort, Co. Louth.* reproduced in Michael McCarthy's *Classical and Gothic.* Refer to Wright's *Louthiana, or an Introduction to the Antiquities of Ireland* (1748).

[32] Rev. Charles Cordiner of Banff, *Remarkable ruins and romantic prospects, of North Britain, with ancient monuments, and singular subjects of natural history* (London: I & J Taylor, 1795). Compare with William Stukeley, *The West View of Waltham Cross* (1721) from the *Ititerarium curiosum*, an account of places and things.

[33] "A Resurrection Stone," June 18th, 1766, *Annual Register*, in William Kent, *London in the News: Through Three Centuries* (New York: Staples Press Incorporated, 1954), p.71.

[34] *London scenes and London people: anecdotes, reminiscences, and sketches of places, personages, events, customs, and curiosities of London city, past and present* by "Aleph" (London: W.H. Collingridge, 1864): 77-82. For more on the London stone, see pages 78-79 and The Stones of Newgate, p.267-279.

[35] Henry Goodhart-Rendel, *English Architecture since the Regency* (London: Constable publishers, 1953): 38.

[36] Ibid., 81. Refer to Charles Eastlake, *A history of the Gothic revival; an attempt to show how the taste for mediaeval architecture, which lingered in England during the two last centuries has been encouraged and developed* (London: Longmans, Green, 1872).

[37] For a historiographic overview of the scholarship on grottoes, see Hervé Brunon, "Une scintillante penombre: vingt-cinq ans de recherches sur les grottes artificielles en Europe à la Renaissance" in *Perspective, La revue de l'INHA: Actualités de la recherche en histoire de l'art* (2007-2): 341-376 and Malgorzata Szafranska, "The Philosophy of nature and the grotto in the Renaissance garden" in the *Journal of Garden History*, Vol. 9, No. 2. (1989): 76-85. I thank Luke Morgan for these helpful references.

[38] Ibid., 16. The quotation is taken from Philippe Morel located on p. 16, which was renumbered from Brunon's original published article.

[39] Ephraim Chambers, *Cyclopaedia, or An Universal Dictionary of Arts and Sciences: Containing the Definitions of the Terms, and Accounts of the Things signify'd thereby, in the several Arts, both Liberal and Mechanical, and the several Sciences, Human and Divine: the Figures, Kinds, Properties, Productions, Preparations, and Uses, of Things Natural and Artificial; the Rise, Progress, and State of Things Ecclesiastical, Civil, Military, and Commercial; With the several Systems, Sects, Opinions, &c. among Philosophers, Divines, Mathematicians, Physicians, Antiquaries, Criticks, &c.* (London: Printed for James and John Knapton, 1728): 187.

[40] Ibid. Chambers relates visual descriptions of other grottos such as one situated near Naples named *la grotto de Cani*: "'Tis a small *Grotto* about 8 Foot high, 12 long, and 6 broad; from the Ground arises a thin, subtle, warm Fume, visible enough to a discerning Eye, which does not spring up in little Parcels here and there, but in one continued Stream, covering the whole Surface of the bottom of the Cave; having this remarkable Difference from common Vapours, that it does not, like Smoke, disperse it self into the Air, but quickly after its Rise, falls back again, and returns to the Earth; the Colour of the Sides of the Grotto being the Measure of its Ascent; for so far it is of a darkish green, but higher only common Earth..."(188).

[41] Patrick Mauriès, *Shell Shock: Conchological Curiosities*, translated by Michael Wolfers and Ronald Davidson Houston (London: Thames and Hudson Ltd., 1994): 53-56. Paul Valéry termed the shell "the semblance of an invention" (15). Mauriès claims that decorative works using shells allowed authors to "annihilate infinity and exterminate repetition" when such an object rotates on itself in ceaseless self-revelation and exhilaration (16).

[42] Erstwhile famous grottos include those at Goldney House, Clifton (1737-1764) and Stourhead in Wiltshire. Refer to *Stowe: A Description of the Magnificent House and Gardens of the Right Honourable Richard Granville Temple, Earl Temple, Viscount and Baron Cobham* (1768).

[43] In Amanda Vickery's *At Home: Behind Closed Doors in Georgian England*, a shellwork vase dated from1779-81, probably made at Pelling Place, Old Windsor, Berkshire, by Mrs. And Miss Bonnell, V&A Museum, London, w.70-1981, and shell-

encrusted surround to a window in the Shell Gallery at A La Ronde, Devon, made by spinster cousins Jane and Mary Parminter, 1790s, National Trust 113317.

[44] Barbara Jones, *Follies and Grottoes* (London: Constable & Co. Ltd., 1974): 36.

[45] Michael McCarthy, *Classical and the Gothic: Studies in the History of Art* (Dublin: Four Courts, 2005): 32-33.

[46] Naomi Miller, *Heavenly Caves: Reflections on the Garden Grotto* (New York: George Braziller, 1982): 84, 85-89 for more on Stourhead, Painshill, and Goodwood. See also Edmund Curll, *The Rarities of Richmond: Being Exact Descriptions of the Royal Hermitage and Merlin's Cave* (London: printed for E. Curll and J. Read, 1736).

[47] Michael I. Wilson, *William Kent: Architect, Designer, Painter, Gardener, 1685-1748* (London: Routledge & Kegan Paul, 1984). John Dixon Hunt, *William Kent, Landscape garden designer: an assessment and catalogue of his designs* (London: A. Zwemmer Limited, 1987) Margaret Jourdain?

[48] *A Plan of Mr. Pope's Garden, as it was left at his death: with a plan and perspective view of the grotto.* All taken by J. Serle, his Gardener. With an account of all the Gems, Minerals, Spars, and Ores of which it is composed, and from whom and whence they were sent. To which is added, a character of all his writings (London: Printed for R. Dodsley, at Tully's Head in Pall-mall, 1745).

[49] Anthony Beckles Willson, "Alexander Pope's Grotto in Twickenham" in *Garden History*, Vol. 26, No. 1 (Summer 1998): 38, 42, 31-59. For another in-depth analysis, see Robert J.G. Savage, "Natural History of the Goldney Garden Grotto, Clifton, Bristol" in *Garden History*, Vol. 17, No. 1 (Spring 1989), p.1-40. He lists all of the natural and manufactured materials used in the Goldney Grotto, from carboniferous limestone, spongestone, tufa, white marble, slate, bricks, furniture slag, and floor tiles.

[50] Serle, *A Plan of Mr. Pope's Garden*, 6. Numb. IV. From fine sparry marble from Lord Edgcumb's Quarry to fine pieces from the eruptions of Mount Vesuvius, Pope's materials included "a fine Piece of Marble from the Grotto of Egeria near Rome, from the Reverend Mr. Spence; with several fine Petrifactions and Plymouth Marble, from Mr. Cooper. Gold Clift from Mr. Cambridge in Gloucestershire; and several fine Brain-Stones from Mr. Miller of Chelsea."

Tin ore, copper ore, lead, and Cornish diamonds were selected for their varying degrees of transparency and color. Figured stones were sometimes white spars interlaced with black cockle. Fossils were also present, along with granated mundic from yellow, purple, and deep blue, lumps of yellow copper, and brown Bristol stones, creating Pope's impression of a rainbow mine that lay hidden underground.

[51] Willson, 43. For the original quotation, see George Sherburn, *The Correspondence of Alexander Pope* (Oxford: Clarendon, 1956) on p.245.

[52] Original quotations are taken from Alexander Pope's correspondence, vol. 4, 246. Reproduced by Morris Brownell, *Alexander Pope and the Arts of Georgian England* (Oxford at the Clarendon Press, Oxford University Press, 1978).

[53] Robert A. Aubin, "Grottoes, Geology, and the Gothic Revival" in *Studies in Philology*, Vol. 31, No. 3 (July 1934): 408-409, 413, 408-416. Mineral decoration was quite common, and fake stalactites figured quite prominently. Fossil gems, marcasites, corals, and other curiosities adorned the fictitious grotto described by Thomas Amory (410).

[54] McCarthy, "The Literature of the Revival," 5-7.

[55] William Chambers, *A Dissertation on Oriental Gardening* (London: Printed by W. Griffin, T. Davies, J. Dodsley, Wilson and Nicoll, J. Walter, and P. Elmsley, 1772): 26, 66-67.

[56] Sir James Hall, "Essay on the Origin, History, and Principles of Gothic Architecture" in *The Gothic Revival 1720-1870*, ed. Michael Charlesworth (East Sussex, UK: Helm Information, 2002): 33.

[57] Georg Germann, *Gothic Revival in Europe and Britain: Sources, Influences and Ideas* (Cambridge: MIT Press, 1973): 28-31.

[58] Ibid., 40.

[59] James Vincent and J. Allen Howe, *The Stones of London: a descriptive guide to the principal stones used in London, with a brief non-technical account of their characteristic features* (London: Colliery Guardian Company, 1923): 15.

[60] "Plugs and feathers" or "plugs and wedges," consist of a metal wedge and two shims. The shims are wide at the bottom and tapered at the top. Placed into a hole of a large piece of stone, they are struck with a maul, producing a ringing tone. A crack eventually appears on the line scored on the surface, allowing the stone to split apart.

[61] Sharpe, *Historic English Churches*, 8-9.

[62] James Ayres, *Building the Georgian City* (New Haven: Yale University Press, 1998): 73. William Salmon, *The London and Country Builder* (1745).

[63] Thomas Maude, *Guided by a Stone Mason: The Cathedrals, Abbeys, and Churches of Britain Unveiled* (New York: I.B. Tauris Publishers, 1997).

[64] Ronald Paulson, *Hogarth: Art and Politics, 1745-1764* (1993) and *Emblem and Expression: Meaning in English Art in the Eighteenth Century* (1975). Refer to eds.

David Bindman, Frédéric Ogée, and Peter Wagner, *Hogarth: Representing Nature's Machines* (New York: Manchester University Press, 2001).

[65] Bernadette Fort and Angela Rosenthal, *The Other Hogarth: Aesthetics of Difference* (Princeton: Princeton University Press, 2001): 4-5.

[66] Ibid., 87-89. Refer to Nicola Coldstream, *Masons and Sculptors* (London: British Museum Press, 1991); S.H. Grimm, *Stone quarry for mouldings on Claverton Down near Bath* (July 1788); Douglas Knoop and G.P. Jones, *The London Mason in the Seventeenth Century* (Manchester: Manchester University Press and Quatuor Coronati Lodge, 1935). "The Rise of the Mason Contractor" in Journal of the Royal Institute of British Architects (43), no. 20, p.1061-1071.

[67] Mary Douglas, *A World of Goods: Towards an Anthropology of Consumption* (New York: Routledge, 2003 [1979]).

[68] Fox, 8-9. Refer to A.E. Richardson, *Georgian England: A Survey of Social Life, Trades, Industries &Art from 1700 to 1820* (London: B.T. Batsford Ltd., 1931).

[69] Keith Thomas, *The Ends of Life: Roads to Fulfillment in Early Modern England* (Oxford: Oxford University Press, 2009): 100. Pride could be found in adamant morality and the strength of a man's working character, which enabled him to live a good life.

[70] Ibid., 103. Refer to Richard Campbell, *The London Tradesman* (London: 1747).

[71] William Adams, *The Duties of Industry, Frugality and Sobriety. A Sermon Preached before a Society of Tradesmen and Artificers, in the Parish Church of St. Chad, Salop, on Easter-Monday, 1766* (Shrewsbury, 3rd edition, 1770), p.16-17.

[72] Geoffrey Beard, *Craftsmen and Interior Decoration in England, 1660-1820* (New York: Holmes & Meier Publishers, Inc., 1981): 27.

[73] Bath Preservation Trust.

[74] Ayres, Appendix I, 230. John Wilton-Ely, "The Rise of the Professional Architect in England" in *The Architect: Chapters in the History of the Profession*, ed. Spiro Kostof (Oxford: Oxford University Press, 1977).

[75] Beard, *Craftsmen and Interior Decoration in England, 1660-1820*, 5.

[76] Ibid., introduction, xxii-xxiii.

[77] Richard Wilson and Alan Mackley, *Creating Paradise: The Building of the English Country House, 1660-1880* (Hambledon and London, London and New York, 2000): 185.

[78] For more on Wren, see Lisa Jardine, *On a Grander Scale: The Outstanding Career of Sir Christopher Wren* (London: HarperCollins Publishers, 2002). Portland Stone, from during the Upper Jurassic era, is marked by even-grained, white, oolitic limestone with varying proportions of shells. Unlike other building limestones, Portland was completely ignored by the Romans, except for local building, despite its quality and location of quarries on the Dorset coast. Coastal location was an important factor in the stone's rise to preeminence, which later found favor in London with Inigo Jones in the early seventeenth century and then with Christopher Wren in the rebuilding of London after the Great Fire.

[79] Lott, 54. Edward Owen, *Observations on the Earth, Rocks, Stones and Minerals...about Bristol* (London: 1754).

[80] Goodhart-Rendel, 27.

[81] See Terry Hughes, "Stone Roofing in England" in C. Wood, *Stone Roofing, English Heritage Research Transactions* (9), p.30-127 (2003).

[82] Dan Cruickshank, *A Guide to the Georgian Buildings of Britain and Ireland* (London: Butler and Tanner, Ltd., 1985): 6.

[83] William Halfpenny, *Practical Architecture* (London: T. Bowles, J. Batley, J. Bowles, 1724); *Magnum in Parvo, or, the Marrow of Architecture* (London: J. Wilcox and T. Heath, 1728); *A New and Compleat System of Architecture* (London: John Brindley, 1749). John Harris, *The Palladians* (London: Trefoil Books, 1981): 99-100.

[84] Amanda Vickery, *At Home: Behind Closed Doors in Georgian England* (New Haven: Yale University Press, 2009): 130-131.

[85] William Chambers, *A Treatise on Civil Architecture* (London: for the author, 1759): preface, ii.

[86] Chambers attested that by inventing and improving the arts, "they have multiplied their productions so as to exceed domestic demands, the supplies the means of transporting them to foreign markets; by commerce enriched...she [architecture] affords them a rational, noble, and benevolent method of enjoying their wealth" (preface, ii).

[87] Ibid., 12.

[88] J.M. Frew, "Gothic is English: John Carter and the Revival of the Gothic as England's National Style" in *The Art Bulletin*, Vol. 64, No. 2 (June 1982): 315-319, 316.

[89] Ibid., 317.

[90] Megan Aldrich, "Gothic Sensibility: The Early Years of the Gothic Revival" in *A.W.N. Pugin: Master of Gothic Revival* (New Haven: Yale University Press, 1995): 12-29, 16-17. Michael McCarthy, *Classical and Gothic: Studies in the History of Art* (Dublin: Four Courts Press, 2005): 30-31. Cynthia Sundberg Wall argues that architectural details in Walpole's *House of Otranto* (1764), from subterranean passages, mouths of caves, intricate cloisters, latticed windows, to recessed oriels appear and vanish, commanding textual and narrative space (117).

[91] Ibid., 19. James Wyatt received the appointment of Surveyor to the Fabric of Westminster Abbey in 1776 when he was thirty years old, followed by his appointment as Surveyor General and Comptroller of Works for the Crown in 1796. He first experimented with a thin, linear Gothic style in designs of 1776-1777 for Sheffield Park, Sussex, the seat of the first Earl Sheffield. In 1785-1786, he designed a battlemented seat, Shane Castle, County Meath, Ireland for the second Lord Conyngham.

[92] Michael McCarthy, *The Origins of the Gothic Revival* (New Haven: Yale University Press, 1987): 157.

[93] Damie Stillman, *English Neoclassical Architecture*, 2 vols. (London: A. Zwemmer, 1988): 492. Damie Stillman, "Church Architecture in Neo-Classical England" in *Journal of the Society of Architectural Historians*, Vol. 38, No. 2 (May 1979), p.103-119. Giles Worsely, *Classical Architecture in Britain: The Heroic Age* (New Haven: Yale University Press, 1995).

[94] Ledoux's quotation is cited by Jean Starobinski in his *1789: The Emblems of Reason* (Charlottesville: University Press of Virginia, 1982 [1973]) on p.73. Original citation by Claude-Nicolas Ledoux quoted by J.C Lemagny in "Les architectes visionnaires de la fin du XVIIIe siècle" in the *Catalogue de l'exposition du Cabinet des Estampes* (Geneva: 1965).

[95] Samuel Ware, *Remarks on Theatres; and on the propriety of Vaulting Them with Brick and Stone: with observations on the construction of domes, and the vaults of the free and accepted masons* (London: T. Bensley, 1809), section III, p.23-33.

[96] Ibid., 51. George Saunders, *A Treatise on Theaters* (London: Printed for the author, and sold by I. and J. Taylor, at the Architectural Library, Holborn [1790]).

[97] Ibid.

[98] Ibid., 32-33. Miles Ogborn in *Spaces of Modernity: London's Geographies 1680-1780* (1998) argues for eighteenth-century modernity in Great Britain as being heterogeneous and hybrid in character, partial, contextual, and a combination of both

modern and traditional elements, see p.22-28. An exemplary case study is the paving of city streets where public and private interests as defined by Shaftesbury, Mandeville, and Hume overlapped with changing notions of urban space.

[99] Alison Kelly, *Mrs. Coade's Stone* (Upton-upon-Severn: Self Publishing Association, 1990): 37. Rupert Gunnis, *Dictionary of British Sculptors 1660-1840* (1953) is one of the first to make a serious investigation of Mrs. Coade's products but according to Kelly, only refers to a small fraction of her total architectural commissions.

Daniel Pincot, *An essay on the origin, nature and uses and properties of artificial stone: together with some observations upon common natural stone, clays, and burnt earths in general: in which the durability of the latter is shewn to be equal, if not superior, to the hardest marbles: being the result of many experiments* (London: Printed for Richard Hett, 1770). Earlier precedent includes Richard Holt, *A short treatise of artificial stone as 'tis now made, and converted into all manner of curious embellishments, and proper ornaments, of architecture*...(London: Printed for Stephen Austen and John Brindley, 1730).

[100] Kelly, *Mrs. Coade's Stone*. Consult Theodore H.M. Prudon, "Simulating Stone, 1860-1940, Artificial Marble, Artificial Stone, and Cast Stone" in *Association for Preservation Technology Bulletin*, Vol. 21, No. 3, 4 (1989), p.79-91.

[101] See the anonymous engraving of the Coade kiln interior entitled *The River God and Statues of the Seasons being fired together* (1784).

[102] Robert Adam, *Observations on Two Trials at Law, respecting Messieurs Adams's new-invented patent-stucco. With additional remarks. By a practical plaisterer* (London: printed for Fielding and Walker, in Pater Noster Row, 1778): 11.

[103] Sharpe, *Historic English Churches*, 15.

[104] Kelly, 75.

[105] Beard speaks of several types of cement - "In exterior use, that known as Parker's or Roman cement, discovered in 1796 by James Parker, was superior. Its use was lessened from about 1843 when Portland cement became a more effective substitute. Martin's cement was capable of taking a fine polish, although it was more usual to mix in metallic oxides to produce a coloured cement. At the rebuilding of the new Palace of Westminster (1837), Parian cement in 'Keatings patent' form was used for internal stucco; it had the advantages of being immune to efflorescence (when, due to nitrification, minute crystals work from the interior to the exterior of the stone), and took paint or paper in 48 hours" (40).

[106] Eileen Harris, *The Genius of Robert Adam: His Interiors* (New Haven: Yale University Press, 2001).

[107] Ibid., Coade stone in Georgian architecture, 83-84.

[108] Alison Kelly, "Coade stone in Georgian architecture" in *Architectural History* vol. 28 (1985): 71-101, 72-73. British Museum Add. MS 41133. Gunnis gives this story.

## Coda: Terrestrial Mythologies and an Invocation of Materiality

...For what was only an incidental and local damage in Dr. Bauer's time became a widespread characteristic of Western Civilization just as soon as it started in the eighteenth century to rest directly upon the mine and its products, and to reflect, even in territories far from the mine itself, the practices and ideals of the miner.

- Lewis Mumford, *Technics and Civilization* (1934)

Myths and proverbial legends surrounding terrestrial substances can divulge much information about what they meant as prosaic things, as natural objects without inherent value and economic commodities infused with fiscal worth. One such parable was recounted by Pliny the Elder who repeated a tale of eagles gliding above an Indian valley hungry to eat dropped pieces of meat, studded with flashing diamonds. When attacked by other circling birds, they promptly dropped their reward. Avaricious villagers would immediately retrieve the eagles' fallen bounty and eagerly sell the diamonds for a tidy profit. In moving to a third-century Buddhist text *Questions of King Milanda*, religious avowals about diamonds such as "let the pure associate with the pure, ever in recollection firm; dwelling harmoniously wise, thus shall ye put an end to griefs" framed the gemstone as an untainted, if not pristine, element.[1]

Even medieval Arab scholarship viewed the diamond in terms of its material composition. Its geometric angles, as explained by judge, poet, and gem dealer Ahmad ibn Yusuf Al Tifaschi, were surrounded by triangular planar surfaces. These philosophers believed that if such a stone was shattered, it would innately "break only into triangular shapes, even if broken into the smallest of parts."[2] Diamonds were labeled with lively descriptors such as "cat's eye" or "cow's urine."[3] Despite their immersion in folklore and oral sources, these notions elucidate some of the cultural dimensions of the diamond as a

terrestrial object, whose modern qualities of resistance, extreme hardness, heat conductivity, and transparency were portended in these early stories.

These commingled narratives about diamonds bore a close resemblance to the beliefs about the perceived value of metals that proliferated during the early modern era. Eighteenth-century royal dinner services commissioned for Louis XV, for example, exemplified the height of luxury metalwork and quality craftsmanship. The status of silver as a precious metal was displayed in the vessels designed for gastronomic cuisine. Artisans chose silver as their material of choice to fabricate ornately etched platters holding rich amounts of beef, poultry, game birds, and goose. French researcher Marie-France Noël-Waldteufel, formerly of the Museum of Popular Arts and Traditions, expounds upon the supposed menus given at the Château de Choisy. Lentil coulis, Spanish onions, rice with crawfish, turnips, chiffonade lettuce, and braised artichokes with Italian chicken paraded alongside pasta with rabbit filets, glazed lamb with apricots, Rouen ducklings bathed in consommé, baked salmon, and perch laced in a Hollandaise sauce.[4] Plentiful, seasoned food reflected the opulent patina of the silver tureens, whose exterior visual motifs frequently mimicked the meats and vegetables contained within their bowels. The lavish textures of unctuous meats and velvet soups were later carried over to the genre of still-life painting where Alexandre-François Desportes and Jean-Baptiste Oudry re-interpreted the silver tureens designed by Thomas Germain.

Stone, akin to diamonds and metals, was equally prevalent among lively fables and allegories that intermittently merged cultural stories with historical facts. In recalling Stonehenge, a few legends boasted that Merlin, the advisor and wizard to King Arthur, had magically transported the megaliths on ships from their native Ireland to England. He

reset them into their original pattern to honor the 300 soldiers slain by the Saxons on Salisbury Plain. In *Historia Regum Britanniae*, twelfth century British cleric Geoffrey of Monmouth maintained the stones were also, at one point, assumed to embody "dancing giants," who were transformed into titanic masses of rock.[5] Stonehenge, as a monument, henceforth became intertwined with Druidic traditions, sun worship, and Arthurian symbolism, legends that still endure in the public imagination.

Beyond European traditions, talismanic figures for various types of stones relied more upon mythological wonder than historical fact for their invocation of human spirit, artifice, and conceptions of science in the natural world. Islamic medievalist Persis Berlekamp cites a fifteenth-century scientific anthology created for Timurid prince Iskander Sultan, which catalogues marble set into a lead ring engraved with an image of a man with a cock's spur, a stick in one hand and a jug in the other. This ring was empowered to protect its wearer from forgetfulness. Sultan Ahmad's manuscript of Tusi's World-Showing Glass designates marble as a white stone and continues the extended description of the ring with an apt warning to its wearer: "he should not eat radishes, and should not send wind through a pipe."[6]

These imaginative explanations in light of our modern perspective are deeply embedded throughout the ages preceding the eighteenth century. But what if these popular stories are misleading, even wrongful, tangents that lead us away from the nature of historical facts? Mythology, it could be argued, merges with history through unexpected junctures, providing an opportunity to reframe how objects, images, and their cultural meanings are considered in relation to one another. The Enlightenment, as one master narrative of modernity, is, in fact, a myth itself. Political theorist Sankar Muthu

proposes that there were multiple Enlightenments, which existed concurrently. He counters contemporary scholarly interpretations with the existence of anti-imperialist rhetoric and policy, much of which lay embedded within the philosophies of Denis Diderot, Immanuel Kant, and Johann Gottfried Herder.[7] The construction of the Enlightenment, like the objects contained within this dissertation, does not always reflect accurate history but possesses a convincing force that only narrative can provide. French social theorist George Sorel in 1908 implied that myths impart overarching consequence to human actions, and as mental constructions, they made historical actors conscious of their place in the historical continuum, endowing actions with even greater meaning.[8] The modernity present in the eighteenth century is vastly different from the one we are currently experiencing.

And what of the modernity of the underground? In returning to the subterranean manifestations that began this dissertation, images of the earth's interior revealed worlds that were shadowy, veiled, and invisible to the human eye. Mining, as we have seen, drew upon historical and mythic investigations of the earth that evoked an eternal fascination with banal substances taken from the ground. Leonardo da Vinci, like many Renaissance intellectuals, abhorred mountains for no particular reason and at the same time, possessed an extreme fear of massive floods, which had been created by swollen streams.[9] Nonetheless, he enjoyed sketching stones and the detailed structure of rocks; many of his initial drawings display an implicit understanding of rock folding in relation to the development of cliffs and valleys. Relying upon his own observations and immediate experience, Leonardo generated visual images that were inaccurate by modern standards but truthfully reflected his own estimation about geological formations.

Such observations produced by a broad spectrum of historical actors co-existed with popular beliefs that did not have any basis in empirical truth or accepted fact. What was considered a truth, in fact, only possessed relative importance. Empirical truth was never absolute. Modern facts, Mary Poovey has argued, are intricably bound to their contexts and never isolated from assumptions that inform theories. What is factual is a historical category in the making. In Poovey's example, numbers connote transparency and impartiality, registering the tensions between "concrete phenomena and the uniform, rule-governed order of humanly contrived systems."[10]

Lorraine Daston has dubbed historical epistemology as a mode of analysis that considers categories of knowledge and institutionalized units such as whole disciplines or societies, informing what is known at any give time as well as how this knowledge can be employed. Even the categorizations of knowledge itself change inevitably over time.[11] More simply stated, these terrestrial objects from diamonds, silver, gold, and stone, were misconstrued by those who encountered them. They were underestimated in their capabilities for man-made endeavors. The constructed narratives around their significance and universalized meaning generated alternate means of creating history. This approach provokes one imperative question: how does the history of the earth and its mythologies come to bear upon the concept of materiality?

These collective mythologies around the character of terrestrial objects contributed to establishing materiality as a notion that co-existed across disciplinary and temporal boundaries. Through its ubiquity and discrete manifestations, materiality — a term that alludes to the multifarious discourses generated by an object's visual and scientific attributes — extended far beyond the physical characteristics of diamonds,

silver, gold, or stone. The term, however vaguely inclusive, does link the explorations of these qualities to the broader discourses of aesthetics, history, politics, and the geological sciences. In emphasizing man-made conceptions of these objects, this dissertation has argued that firsthand experiences, constructed from intuitive impressions and empirical observations, formed historical perceptions of these objects' corporeal attributes. History, in effect, became conditioned by human familiarity.

The same verdict was reached by Giambattista Vico in *Scienza nuova* (1725). He claimed that man was a being who could only be understood historically. Vico's perceptive insight into the logic of historical knowledge could be encapsulated in his principle of the equivalence of *verum* and *factum* – or truth and fact. The world of nature, as he put it, was comprehensible only by God, whereas a creation such as mathematics could be fathomed by man since it was something of his own making.[12] Terrestrial objects, including diamonds, metals, and stone, could only be fully apprehended through man-made contrivances that placed them securely into the recognizable categories of jewelry, decorative ornament, coins, medals, architectural follies, and buildings. Extracting information from their physical attributes was made more complex through the circuitous routes taken by these objects that were later developed into designed commodities, architectural spaces, and scientific techniques.

**(Fig. 4.1)** The earth as a large-scale entity, as seen in this globe fabricated by geographer Edme Mentelle and Jean Tobie Mercklein at the Château de Versailles, exposes a bird's eye view into the heart of what had been concealed underground. Commissioned as a pedagogical tool for the young Dauphin's edification, the globe contains two worlds – one of the continents in topographical relief existing as the interior

core, another of Europe's relationship to newly discovered territories – nested comfortably inside one another. The Old World, represented by Europe, and the New World, designated by the Americas, are mapped onto the lifted outer hemispheres of the globe.[13] This final image is fitting since it portrays a sculptural core covered with three-dimensional masses, which only becomes visible through a visceral dismemberment of the earth's surface. The anatomization of the ground itself, either in part or whole, is reduced to a cleanly segmented set of geometric spheres with delimited continents that illustrate sharp boundaries between land and sea.

In resurrecting the complexities between artful nature and natural artifice, we are perhaps at a loss, pondering what these terrestrial objects have to offer us. Their longevity and paradoxical character lasted well into the era of architectural historian Lewis Mumford, who equated mining with the exploitative powers of twentieth-century capitalism. In *Technics and Civilization* (1934), Mumford explored the mine's significance as a working environment and even a formative model for all types of industrial ideas and initiatives. He split a historical timeline into three distinct ages: the eotechnic (1000AD – eighteenth century), paleotechnic (industrial epoch) and neotechnic (early twentieth century).[14] Mumford suggested that mines, in their complexity, established fundamental attitudes towards the all-encompassing categories of nature, work, machinery, techniques, and most of all, human experience. His grand narrative, in particular moments, now seems somewhat suspect, but given this concept of the mine as an expansive platform, we can discern that contemporary notions of a geological imaginary, in fact, do rehearse and repeat eighteenth-century conceptions of the earth, which have now only expanded in scope and depth.

In contrast to Mumford's formulation, theorist and post-colonial scholar Dipesh Chakrabarty has revived civic interests in non-human actors and a non-human chronology based around the events of the earth. His article "The Climate of History: Four Theses" in *Critical Inquiry* (2009) highlights the use of climate science for historical and political thinking, opening the door to evaluating chronological events across multiple fields of disciplinary study but also against extreme durations of time not measured by human actions. The finitude of humanity gives us pause about how our present is related to our future. His first proposed thesis in this article collapses the humanist distinction between natural history and human history. Human beings are no longer a biological agent in his words but in burning billions of tons of fossil fuel, they "...now wield a geological force," having increased in numbers and invented technologies that have an impact on the planet.[15]

The universal chronicle of the earth, in closing, is not a singular one, nor has it been completely resolved. What we comprehend about the natural world is, at once, a single narrative and many histories in unison, perpetually unfolding. "Big history," whose proponents include current scholars Cynthia Stokes Brown, David Christian, and Fred Spier, attempts to incorporate every continent and major historical movement into the framework of its ambitious time-scale. Variations of this model have forcefully entered the areas of climate history, environmental history, geopolitical theories, and geo-engineering, a new science devoted to employing radical strategies to re-sculpt the earth's terrain.[16] Paul Hoffman, an eminent geologist, has predicted that the planet will eventually transform into what he calls "Snowball Earth," a world completely swathed in ice sheets without sustainable vegetation or ecological systems. Hoffman insists that

moraines, or glacially formed accumulation of unconsolidated debris of soil and rocks, are the key to predicting glacial recession as a result of ensuing climate warming.[17] Human interventions will inevitably remain enmeshed with nature's cycles of rupture and renewal, whether in the eighteenth century or the present. Our prescience of this antediluvian encounter will come not from history but from our own sensibilities and the ground upon which we dwell.

**Illustrations**

Fig. 4.1: Edme Mentelle and Jean Tobie Mercklein, globe (1786) at the Château du Versailles, image by Natasha Naujoks

[1] George E. Harlow, "Following the History of Diamonds," in Harlow, ed., *The Nature of Diamonds* (Cambridge: Cambridge University Press, 1998): 121.

[2] Ahmad ibn Yusuf Al Tifaschi's *Best Thoughts on the Best of Stones*, translated and with commentary by Samar Najm Abul Huda (Lanham, MD: Scarecrow Press, 1998).

[3] Harlow, *The Nature of Diamonds*, 117. See L. Finot, *Les lapidaries indiens* (Paris: École des Hautes Études, 1896).

[4] Marie-France Nöel-Waldteufel, "Les Menus du Roi" in *Tables royales* published by *Les connaissance des arts* (1993): 33-34.

[5] Geoffrey of Monmouth, *Historia Regum Britanniae* (1138). Stonehenge, known as the giant's dance, constituted healing rocks brought by giants from Africa and Ireland for their curative properties.

[6] Persis Berlekamp, *Wonder, Image, and Cosmos in Medieval Islam* (New Haven: Yale University Press, 2011): 132. The short text belies a more complex message as stated by Berlekamp; the actual wording puns in ways that complicates matters. The Persian word for setting the stone also suggests the stamping of a signet ring, blurring the distinction between the production and implied function of the object. The manner in which these words within the instructions collapse distinctions was suitable to the ways talismans were expected to function. They worked through a "conceptually and materially melded symbiosis" that effected contact between one realm of the cosmos and the next (133).

[7] Sankar Muthu, *Enlightenment against Empire* (Princeton: Princeton University Press, 2003). Muthu offers that late Enlightenment rhetoric posited all human beings as having a common disposition. In reference to the diversity of populations found in European colonies, diversity should thus be accepted as a natural right. Consult Uday Mehta's *Liberalism and Empire: A Study in Nineteenth-Century Liberal British Thought* (1999) and Jennifer Pitts' *A Turn to Empire: The Rise of Imperial Liberalism in Britain and France* (2006).

[8] Georges Sorel, *Reflections on Violence*, ed. and trans. Jeremy Jennings (Cambridge: Cambridge University Press, 1999), p.20. In *The Enlightenment: A Genealogy* (2010), Dan Edelstein expounds upon the notion of myth in relation to modernity and more contributions by other scholars can be viewed in his online journal *Republics of Letters* (117). Refer also to Joan de Jean, *Ancients against Moderns: Culture Wars and the Making of a Fin de Siècle* (1997); Marc Fumaroli, "Les abeilles et les araignées" in *La querelle des anciens et des modernes* (2001); François Hartog, *Anciens, modernes, sauvages* (2005); Larry F. Norman, *The Shock of the Ancient*; Levent Yilmaz, *Le temps moderne: variations sur les anciens et les contemporains* (2004).

[9] S.A. Norwick, "Geologic Image and Icon in the Works of Leonardo da Vinci" in *Geological Society of America, Abstracts with Programs* 12, 493 (1980). Taken from Othmar T. Tobisch, "Connections between the Geological Sciences and Visual Art: Historical Perspectives and Personal Expression in Artwork" in *Leonardo*, Vol. 16, No. 4 (1983), p.280-287.

[10] Mary Poovey, *A History of the Modern Fact* (Chicago: University of Chicago Press, 1998): 5, 27-28.

[11] Ibid., 7. Lorraine Daston, "The Moral Economy of Science" in *Constructing Knowledge in the History of Science*, edited by Arnold Thackray (Chicago: University of Chicago Press, 1995) and Peter Dear, *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago: University of Chicago Press, 1995).

[12] Giambattista Vico, *The New Science* (Ithaca: Cornell University Press, 1984 [1744]). See also G.J. Whitrow, *Time in History: The Evolution of our General Awareness of Time and Temporal Perspective* (New York: Oxford University Press, 1988), p.139-151.

[13] Consult the description of this globe as part of the exhibition "Science and Curiosities at the Court of Versailles" (2011):

"In France the 18th century was the golden age of globe makers, who crafted objects showing recent discoveries on land and sea or in the heavens. Astronomers, botanists and zoologists set out to explore the world on long expeditions, such those of Bougainville or Lapérouse.

A mechanic named Mercklein made this globe, one of the teaching tools Louis XVI commissioned for the Dauphin, by following instructions from geographer Edme Mentelle, who based the measurements and proportions on documents in the navy's map department. Its base features a sculpted décor depicting three dolphins whose raised tails hold up the horizon table, the centre of which features four figures of the blowing winds. The inner globe shows emerged land in relief as well as the sea depths, recording the cutting edge of knowledge at the time.

The first globe, moving and in relief, is inserted inside two hemispheric segments: the upper section shows the Old World and the lower one the New World. Inside, the vault of heaven is shown with the constellations and signs of the zodiac. Mentelle's globe demonstrates how advanced these teaching tools were for their time. Its originality lies in a system of moveable political geography maps that can be screwed into small holes in the inner globe. The maps have vanished but the holes remain visible. Globes were prestigious items that often appeared in sovereigns' portraits during this period."

Later nineteenth-century works such as Alexandre Brongniart's *Théorie de la structure de l'écorce du globe* (1829) closely examined the composition of the earth's soil in relation to its structure.

[14] Lewis Mumford, *Technics and Civilization*, with an introduction by Langdon Winner (Chicago: University of Chicago Press, 2010 [1934]): 72. In *Notes from the Underground: An Essay on Technology, Society, and the Imagination* (2008), Rosalind Williams extends Mumford's metaphor of the mine to include other cultural aspects of the modern underground such as sewer systems, railways, sea caves, and Tutankhamen's sepulcher.

[15] Dipesh Chakrabarty, "The Climate of History: Four Theses" in *Critical Inquiry* 35 (Winter 2009): 197-222, 206.

[16] Popular science journalism such as Jeff Goodell, *How to Cool the Planet: Geoengineering and the Audacious Quest to Fix Earth's Climate* (New York: Houghton Mifflin Harcourt, 2010) and Eli Kintisch, *Hack the Planet: Science's Best Hope – or Worst Nightmare – for Averting Climate Catastrophe* (New York: Wiley, 2010). Growing doubts about the efficacy of mainstream strategies – conservation, alternative energy, algae blooms – have led policymakers and experts to consider more radical alternatives of managing the earth's climate.

[17] Sir John Leslie (1766-1832), while at the University of Edinburgh, pointed to *moraines* (glacial masses carrying soil and other debris) as the important indicators of climate warming. They were prone to absorbing sunlight, or solar radiation. Other significant contributors to developing the history of climate science include Baron Joseph Fourier (1768-1830); William Herschel; T.C. Chamberlain (1894); Georges Cuvier; James Smith; John Tyndall (1820-1893).

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