



*Facets of Light:
The Case of Rock Crystals*

وہوہ النور، مسالہ البلور
انا کونوی

Anna Contadini



This essay concentrates on the production of rock crystal during the period of Fatimid rule in Egypt (969–1171), which has given us—both in number and in quality—the most impressive extant Islamic rock crystals. Alongside a review of the sources, it pursues three main areas of enquiry: the physical nature of the substance itself, the techniques of manufacture, and the cultural meanings that might have been attached to the light properties of rock crystal objects.

Rock crystal (Arabic: *billawr*) is a type of quartz, with the transparent variety also called hyaline quartz. Found all over the world, rock crystal is one of the most common minerals in the earth's crust, occurring in hexagonal crystals of different dimensions. For classical authorities the combination of crystalline structure and translucency suggested an analogy with ice, and because of this a cooling effect was ascribed to rock crystal, with the corollary that crystal vessels could not tolerate heat. It is in fact correct to say that rock crystal is a poor heat conductor, so that if only part of a crystal object is heated, the other part remains relatively cool, thus creating tension. With Richard Cook, former head of Sculpture Conservation at the Victoria and Albert Museum (V&A), I conducted an experiment in which a rock crystal was half buried in sand and the exposed part was heated. At about 100 degrees part of it splintered off and at about 230 degrees it exploded, breaking off along the fracture planes at exactly the point between the buried and the exposed parts.

Whether a rock crystal vessel breaks when dropped is determined by whether it hits a fracture plane on impact. If it does, it shatters into many pieces, as demonstrated by the ewer (pl. 90), carved in relief and datable by the inscription to 1000–08, in the Museo degli Argenti of Palazzo Pitti (Rice 1956): in an unfortunate accident in 1998 it broke along the fracture planes into some 80 fragments. Despite the assertion by Pliny (first century CE) that “once it has been broken, rock crystal cannot be mended by any method whatsoever” (Pliny 1962, Book 37, 185), the Pitti ewer was restored by Florence's famous Opificio delle Pietre Dure through a complex program of assemblage involving the use of cyanoacrylate resin (Cappelli 2008). However, although expertly repaired, the way that the crystal with its relief reflects and refracts the light has been permanently altered (pl. 91).

If one thinks of the size of rock crystal ewers in which the handle is integral to the body, it is clear that crystals of huge size must have been found on occasion. Ibn al-Zubayr, judge during the reign of the Fatimid caliph al-Mustansir (r. 1036–94), speaks of a multitude of rock crystal vessels in the palace treasury, many of them of large size. In his treatise, *Kitab al-Hadaya wa'l-Tuhaf* or *Book of Gifts and Rarities*, pieces even larger than the ewers are mentioned (trans. al-Qaddumi 1996, 238–39, paragraphs 409, 402, and 404 respectively):

Nazir al-Juyush also acquired [from the palace treasures] a spouted ewer (*kuz*) of [unengraved] smooth rock crystal fashioned like the bronze (*nuhas*) ones [usually] made [to be attached] to [water] storage jars with conical bases (*zir*). Its handle was carved from the same block [of rock crystal]. The spouted ewer carried ten Egyptian *ratls* of water. [The fabric of] its case (*suturuhu*) was adorned all over with precious pearls...

89 (opposite) Rock crystal bottle, a perfume or make-up holder, in the form of a lion, 11th century, Egypt, 6.03 × 4.45 cm. British Museum, London (Inv. AC FB1s.12).

90 (p. 126) Rock crystal ewer (before it was broken), dated between 1000 and 1008, Egypt, h. 15.5 cm. Mounted with a lid and base (now largely lost) of gold and enamels after it arrived in Europe. It formed part of the collection of Lorenzo il Magnifico de' Medici. Palazzo Pitti, Florence (Inv. No. 1917).

91 (p. 127) The Pitti Ewer being repaired. Palazzo Pitti, Florence.







92a-c The "Ager Chessmen," rock crystal carved in relief (style set A), 10th century, Egypt. Dar al-Athar al-Islamiyyah, Kuwait:

a) (top, left) king or queen, 6.8 × 6 cm (LNS 1 HS a);

b) (top, middle) elephant (bishop), 5.3 × 4.5 cm (LNS 1 HS e);

c) (top, right) rook, 4.2 × 4.8 cm (LNS 1 HS g).

93 (above) Rock crystal seal of Fahd ibn Ibrahim, end 10th–early 11th century, Egypt, h. 3 cm. Islamic Art Museum, Cairo (Inv. No. 14683).

Nasir al-Dawlah acquired a large storage jar (*qatramiz*) of rock crystal with images (*suwar*) carved in [high] relief (*nabatah 'an jismihi*) and having a [liquid] capacity of seventeen rats ...

A large box (*majma'*) for [keeping] appetizer saucers (*sakarij*) [was found] with its cover (*ghita'*) cut with a lathe (*makhrut*) from a [single] block of rock crystal. It contained appetizer saucers of rock crystal, which could be removed and put back into it. It was four spans by four of beautiful workmanship (*al-san'ah*).

Smaller pieces were used to fashion a great variety of artifacts, from dishes to chess pieces (Contadini 1995, fig. 43; Curatola 2010, 79, cat. 43; pl. 92a–c) and seals (Seipel 1998, 131–32, cat. 103; pl. 93) to little perfume or make-up holders in the shape of creatures such as fish or lions (Arts Council of Great Britain 1976, 125, cat. 103; pl. 89) and bottles of various shapes (Contadini 1998, 37, pl. 4; pl. 94a–b).

The treasury was looted and dispersed during social unrest in the 1060s, and according to the Mamluk chronicler al-Maqrizi (1364–1442) a vast number of rock crystal pieces came onto the market: he mentions a (most probably inflated) figure of 18,000 pieces, fetching from 10 to 1,000 dinars each, an enormous sum (al-Maqrizi 1853, I:



94a-b a) (left) Carved rock crystal bottle, 975-1050, Egypt, Cairo (?), h. 14.8 cm with base, diam. 3.1 cm (reconstructed base). Victoria and Albert Museum (A.45-1928); b) (right) detail of pl. 94a.

414; Kahle 1935, 340). In many instances al-Maqrizi remarks upon their huge size or capacity (up to 9 *ratls*, about 5 liters), but his descriptions unfortunately give no indication of the technique or style of decoration and are not precise enough to allow identification with extant rock crystals. Nevertheless, when he mentions two pieces of rock crystal from the treasury that a "reliable witness" had seen in Tripoli as "extreme in purity and beauty of craftsmanship, one of them a ewer and the other a jar with the name al-'Aziz bi'llah written on the side of each one" (al-Maqrizi 1853, I: 414; see also Kahle 1935, 345; Erdmann 1951, n. 15), one is tempted to think that the ewer could be the al-'Aziz ewer now in the treasury of St. Mark in Venice (Hahnloser 1971, 112-13, cat. 124, pls. XCVIII-IX; pl. 95a-b).

Several authorities ascribe magical and healing powers to rock crystal, but all sources, ancient and medieval, Arabic and European, remark upon its light properties. For example, Pliny, for whom rock crystal is incomparable for its transparency and hardness, also comments on its ability to split light into a spectrum (Pliny 1962, Book 37, 275). The great Iranian polymath al-Biruni (973-1048), who wrote a treatise on minerals entitled *Kitab al-jamahir fi ma'rifat al-jawahir*, tells us that rock crystal "is notable for its clarity, resembling the two essential elements of life, air and water" (al-Biruni 1936, 183).



95a-b a) (left) Rock crystal ewer of the Fatimid caliph al-'Aziz, 975-96, Egypt, h. 18 cm. Archives of the Procurator of the Basilica di San Marco, Venice (Inv. No. 80); b) (right) detail of pl. 95a.

and notes that "when sunlight strikes it the colors of the rainbow become visible" (ibid., 185). He speaks of high quality rock crystal being imported from the "Isles of Zanj" (East Africa) and from al-Dibajat (the Laccadive and Maldive Islands in the Indian Ocean) to Basra in Iraq where it was worked by local craftsmen. Al-Biruni also quotes earlier Arab authorities, including al-Kindi (d. c. 866), for whom the best rock crystal in terms of clarity is the Arabian one. Al-Biruni mentions other sources in the Pamirs (Wakhan in present-day Afghanistan and Badakhshan in present-day south Tajikistan), Kashmir, and Sri Lanka, but states that there is no demand for the rock crystal from the Pamirs, while that from Kashmir and Sri Lanka is inferior in quality, being less translucent (al-Biruni 1936, 184; also Kahle 1936, 332-34). Nasir-i Khusraw, the Iranian traveler writing in the mid-eleventh century, tells us that unworked crystal from the Maghrib was being replaced by finer quality, more translucent material from Qulzum (modern Suez) on the Red Sea; and he also gives an eyewitness account of beautiful rock crystal objects being worked in relief in the bazaar of Fatimid Cairo (Nasir-i Khusraw 1881, 149). The North African anthologist al-Tifashi (1184-1253), who wrote a comprehensive treatise on the use of minerals, *Kitab Azhar al-Afkar fi Jawahir al-Ahjar*, says that at thirteen days' journey from Kashgar there are two mountains whose interior consists entirely of beautiful rock crystal; it is worked at night, as the reflection of the



96a (left) Fragment of cylindrical rock crystal bottle (perfume or make-up holder) with a circular boring in the middle, first half of 11th century, Egypt, h. 3 cm at highest point, diam. 1.7 cm. Victoria and Albert Museum (A.11-1942).

96b (middle) Detail of the bottle in pl. 96a, photographed at raking light magnification, showing, on the right, how the crack functions as a barrier to the light and creates a dark area. Victoria and Albert Museum (A.11-1942).

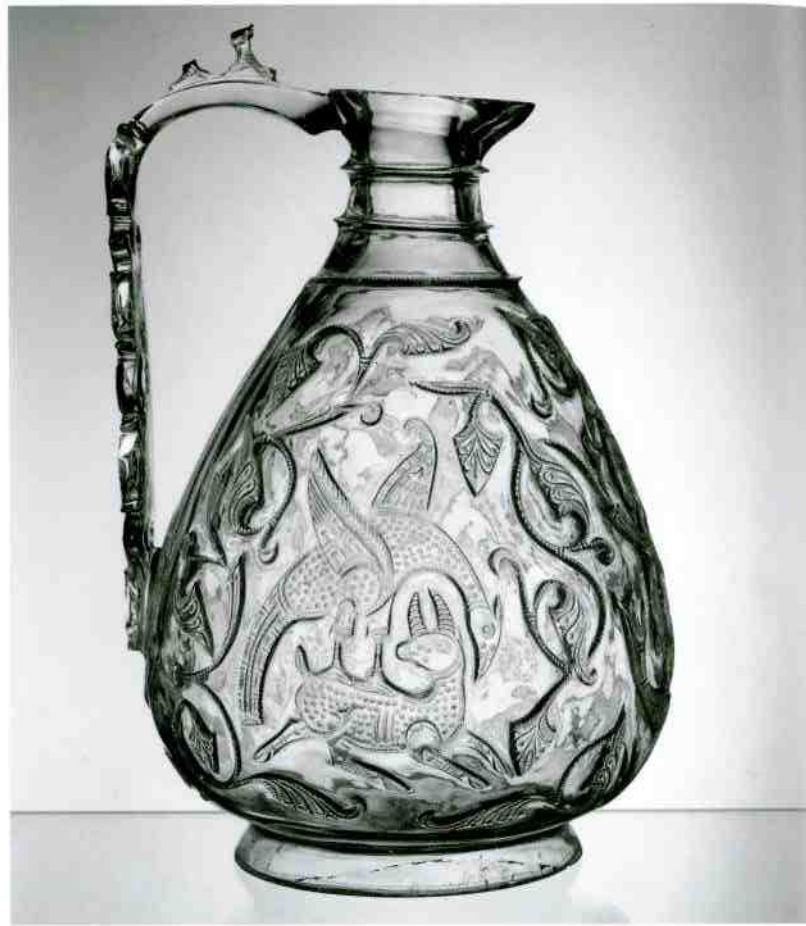
96c (right) Detail of pl. 96a, with part of the inscription ("li-ṣā...") carved in relief around the body of the bottle. Photographed under Dino-Lite at 80% magnification, it shows the effects of the light as it hits the surface. Victoria and Albert Museum (A.11-1942).

sun's rays renders work by day impossible (al-Tifashi 1977, 202). While emphasizing various light properties, translucency, polarization, and, in the last case, a blinding brilliance, these writers thus offer information on a wide range of sources of supply in the Islamic period, references to two centers (Basra and Cairo) for the working of rock crystal in the tenth and eleventh centuries, and decided opinions about variations in quality, all based on the clarity and translucency of the crystal.

Another aspect mentioned by al-Biruni is the way in which the carving of the crystal might conceal imperfections such as cloudiness or cracks (al-Biruni 1936, 184). For the ways in which these alter the reflection and refraction of the light we may take as an example a fragment of a small cylindrical bottle in the V&A (pl. 96a), datable to the first half of the eleventh century, with an abbreviated inscription carved in relief around it that invokes blessing for the owner, *baraka li-sahibihi* (Contadini 1998, 37, pl. 5). Although a hair-line crack can just be discerned by the naked eye, the photographic techniques of raking light and Dino-Lite show that the magnified area corresponding to the depth of the crack appears black: the crack functions as a barrier to the light, creating a dark area (pl. 96b).¹

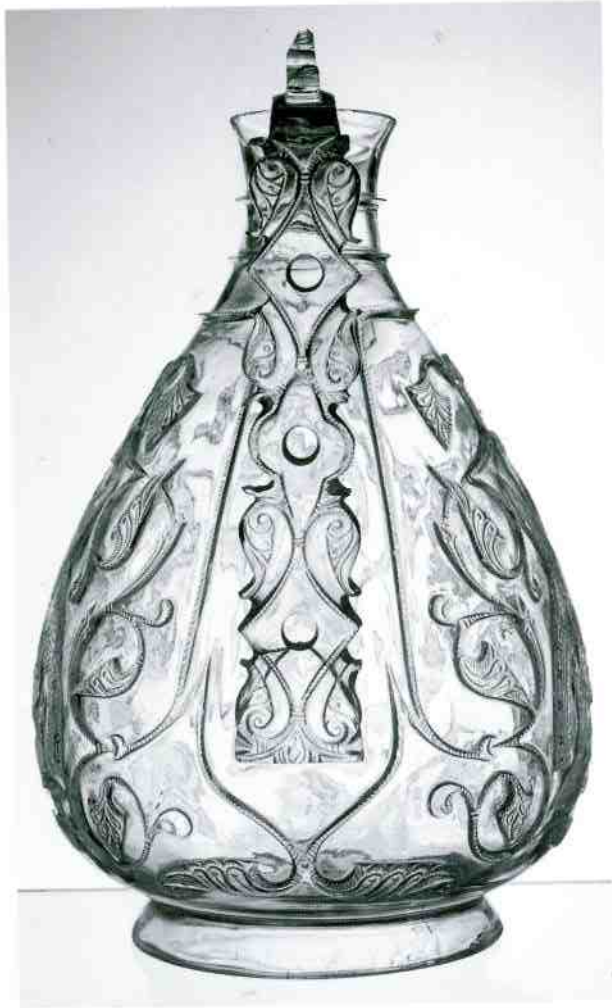
Carving in relief produces surfaces at different angles to the body, thereby causing complex reflections, refraction, and also fluorescence where the light striking the crystal breaks into the rainbow spectrum. These effects contribute to make rock crystal objects vibrant, as the light travels in different directions. The complex angles and curves created by the carving can be seen clearly from photos taken at a magnification of *circa* 80%, which also show the resulting effects on the light as it hits the surface of the vessel (pl. 96c). The best pieces, those made between the late tenth and eleventh century, exhibit several different types of cut: perpendicular, at 45 degrees, higher and lower relief, semi-spherical dots, and incised vertical and horizontal lines of varying width. Some of the more complex pieces also show the so-called "line and dot" motif, as in the V&A rock crystal ewer (Contadini 1998, 37–38, pl. 7; pl. 97a–e).

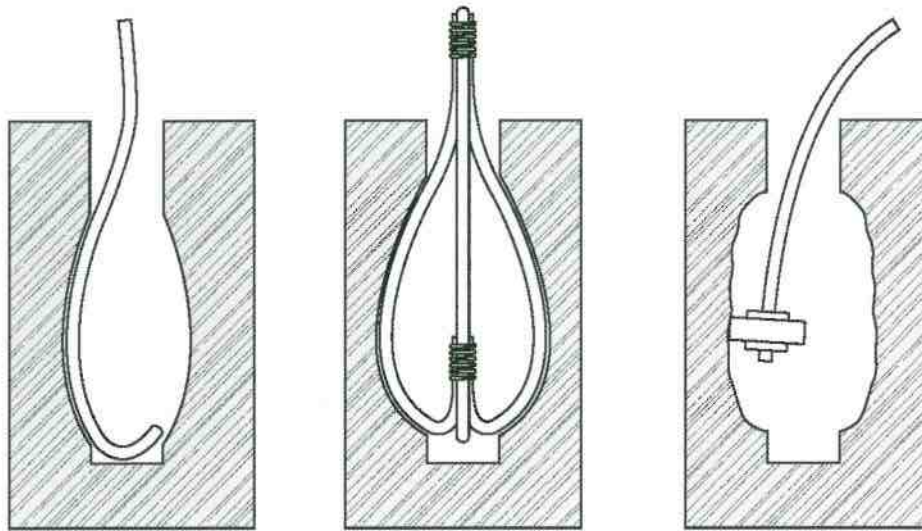
Despite the abundance of Islamic rock crystals, what we know of the history of the techniques of carving is not based upon production in the Near East. Rather, the general principles may be derived from early seventeenth-century German treatises; accounts of traditional German, Indian, and Chinese lapidaries; iconographic evidence; and the accounts of the French jewelers Tavernier and Chardin, who describe the gem cutter's craft during the seventeenth century in India and Iran respectively (Tavernier



97a-e (above and opposite page) Rock crystal ewer, shown in four different views and a detail, 11th century, Egypt, h. 19.5 cm, diam. of belly c. 14 cm. Victoria and Albert Museum (7904-1862).

1678, Part 2, Book 2, 134–35; Chardin 1811, IV: 4, 142–43) as well as by checking these findings against the experience of a contemporary stone carver who is particularly interested in rock crystal. A first basic question concerns not the surface but how a rock crystal was hollowed out: the ewer in the V&A, for example, is extraordinarily thin in relation to its size, and the only opening, the mouth, is very small in relation to the size of the belly. The technique can be reconstructed as follows (pl. 98): the shape of the vessel was first roughly cut with a saw and shaped by chipping with a small hammer (a technique still employed), and a hollow, cylindrical tool was then used to make an opening. This tool must have been of hard metal, quite possibly, as today, of steel, which was used in the Arab Middle East already in the tenth century and in Iran in the ninth, as the Merv excavations have shown (Hermann *et al.* 1996; Simpson 2001). Used in combination with an abrasive, probably of water and sand, the tool was rotated, possibly with a bow drill, in order to start penetrating into the rock crystal. Once the tool had reached a sufficient depth, a sharp tap would be enough to snap off the crystal core inside, which could then be extracted together with the tool. This done, the cavity was extended to the required depth by a drill attached to a bow lathe. In order to widen the cavity, a steel wire or a group of steel wires was then introduced in the central hole: when pressed, the wires would curve and, with the help of an abrasive, would be rotated to scratch away the inner wall until the interior of the vessel was carved out as required. A smooth finish could have been achieved by introducing through the aperture pebbles and an abrasive, such as sand or diamond dust and water, or hematite, a good polisher, and then turning the object so that centrifugal force would press and rotate the abrasive against the inner walls (Contadini 1999).



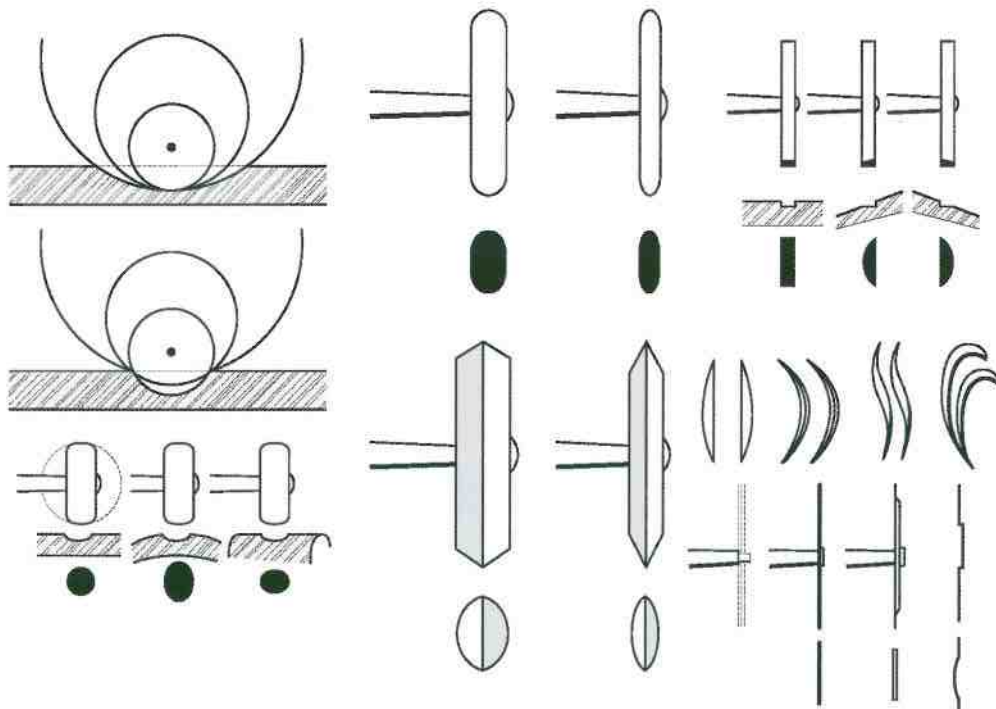


98 (above) Diagram of the techniques of hollowing out the inside of a rock crystal ewer (from Ralph Pinder-Wilson's archive).

99 (opposite) A lapidary carving a ruby. Detail from an album of paintings for the Mughal emperor Jahangir, c. 1019/1610-11. National Museum/Náprstek Museum, Prague, Czech Republic (A 12182).

The above operations are all very delicate, requiring great skill and a thorough understanding of the fracture planes of the mineral. Once completed, the working of the outer surface could commence, using a bow-lathe with a fixed spindle to one end of which was attached either a drill or a small wheel. One hand rotated the spindle by pushing the bow backward and forward while the other hand (or in the case of the ewers, probably more than one hand) grasped the crystal, manipulating it against the drill or disk. The use of the term *makhruṭ* (lathe) in the quotation from the *Kitāb al-Hadaya* cited above is consonant with such a technique. This operation is also depicted in process on the margin of a page from the album of paintings made for the Mughal emperor Jahangir in about 1610-11: it shows a lapidary using the bow drill to cut a ruby (pl. 99). The choice of wheel would determine the type of cut and the angle of the relief in relation to the body (pl. 100). The same technique had been used in the ancient world for cutting not only other hardstones such as agate and sardonyx

100 (below) Cutting wheels diagram showing the different cuts produced (from Ralph Pinder-Wilson's archive).







101 (top, left) Rock crystal with its core hollowed out using the tool on the left.

102 (top, right) Different sized cutting metal wheels used in stone carving.

103 (bottom, left) Power-driven drill to which the tools and wheels are attached.

104 (bottom, right) Cutting a piece of rock crystal on the lathe while cold running water is used to flush out the powder and cool down the wheel.

but also glass. It seems likely that glass cutting was inspired by hardstone carving, and the two industries could well have existed side by side.

A rock crystal carver has confirmed that the above scenario is plausible, as contemporary carvers use a very similar technology, the only difference being that the process is power driven.² Plates 101–03 show the cylindrical metal instruments that he uses to make the opening in the stone; the tools and wheels of various sizes for carving, made of a soft metal like copper and used with an abrasive powder around the outer edge of the wheel; and the power-driven drill to which the tools are attached. During the cutting, cold running water is used not just to flush out the powder it produces but also, and especially, to cool the wheel, as the process generates considerable heat (pl. 104).

Complex carving techniques involving different angles of cut may be used to maximize the capturing and reflection of light, making the object appear vibrant and alive. The Keir ewer (pl. 105a), for example, an extraordinary piece that was sold at Christie's



105a (*above, left*) Rock crystal ewer, early 11th century, Egypt, with 19th century silver and enameled mounts, French, total h. 30.7 cm. Keir Collection.

105b (*above, top right*) Detail of cheetah carved in relief on the right of the body of the ewer.

105c (*above, bottom right*) Detail of cheetah on the left side of the body of the ewer showing how the outlines of the cheetahs are in relief, with the actual body of the animal at the same level as the undecorated surroundings.

in 2008 with its nineteenth-century French gilded and enameled mount, is very translucent and has been polished to a high degree (Christie's 2008; Weber 2011). Its decoration includes cheetahs with a collar with link-chains (pl. 105b), with the outlines of the cheetahs in relief, while the actual body of the animal is at the same level as the undecorated surroundings (pl. 105c). The risk run in carving dots into the very thin body area was therefore considerable. A similar approach is to be found on some glass carved in relief, as shown by the beautiful and large clear glass bowl in the treasury of St. Mark, Venice (pl. 106), where the contours of the lions are in high relief but the bodies are not (Hahnloser 1971, 107–08, cat. 120, pl. XCIV) whereas on other objects, such as the V&A ewer and a flask in the Keir collection (Pinder-Wilson 1988, 303–05, col. pl. 62), the animals and vegetal motifs are carved from an area that is at a higher level than the surrounding background (pl. 107a–b). This technique is also used on glass, as on the turquoise glass bowl in the treasury of St. Mark (Hahnloser 1971, 103–04, cat. 117, pls. LXXXIX–XC). Here, again, the whole area of the hares stand out in relief from the lower background (pl. 108).



106 Glass bowl with lions,
10th–11th century, Egypt?, h.
13 cm, max. diam. 15 cm.
Archives of the Procurator of the
Basilica di San Marco, Venice
(Inv. No. 117).

107a (opposite, top left) Rock
crystal flask, early 11th century,
Egypt, h. 10.7 cm. Keir
Collection (R11).

107b (opposite, top right)
Detail, showing how the birds
are carved from an area that is at
a higher level than the
surrounding background.
Keir Collection (R11).

108 (opposite, bottom)
Turquoise glass bowl, 9th–10th
century, probably Egypt, with
gold and silver gilt Byzantine
mount, 11th century, and 15th
century (?) Italian enamels,
h. 6 cm and diam. 18.6 cm.
Archives of the Procurator of the
Basilica di San Marco, Venice
(Inv. No. 140).

Ibn al-Haytham (d. 1039), who actually lived in Fatimid Cairo, wrote a *Kitab al-Manazir* (Book of Optics), which includes a section on transparent objects. In his discussions on rock crystal and glass, he repeatedly states that light can play through a thinly made and transparent body (Ibn al-Haytham 1989, I: 332–40), and the best rock crystal vessels are thin indeed. I was able to measure the V&A ewer (see pl. 97a–e) which, excepting the slightly thicker lower part, has an average thickness of 1.7 mm for the ground body and just over 2 mm for the parts with the relief decoration. Measuring 19.5 cm high, with the diameter of the belly at about 14 cm, the ewer weighs about half a kilo.

The al-ʿAziz and related ewers, which date to the last quarter of the tenth century, represent a pinnacle of artistic achievement. But the challenges faced by their Fatimid carvers were by no means novel. Rock crystal had been fashioned into objects of particular rarity since classical times, and in the central Islamic lands it had probably been carved from the very rise of Islam in the seventh century, so that the outstanding skills of the Fatimid craftsmen mark the culmination of a centuries-old tradition of artisanal expertise. For both stone carving (such as agates) and glass cutting we know of long-standing production in Iran, Egypt, Syria, and other regions, although we unfortunately know little about its evolution, and its economic (and social) structure during the Fatimid period also remains obscure. However, we do have some information from al-Biruni, who tells us that “in Basra the rough crystal is first seen by an assessor (*al-muqaddir*), who decides what would be the best objects to make out of the big and small pieces and writes this on each of them” (al-Biruni 1936, 184).³ He goes on to tell us that the pieces are then taken to the craftsman to carve. Interestingly, the



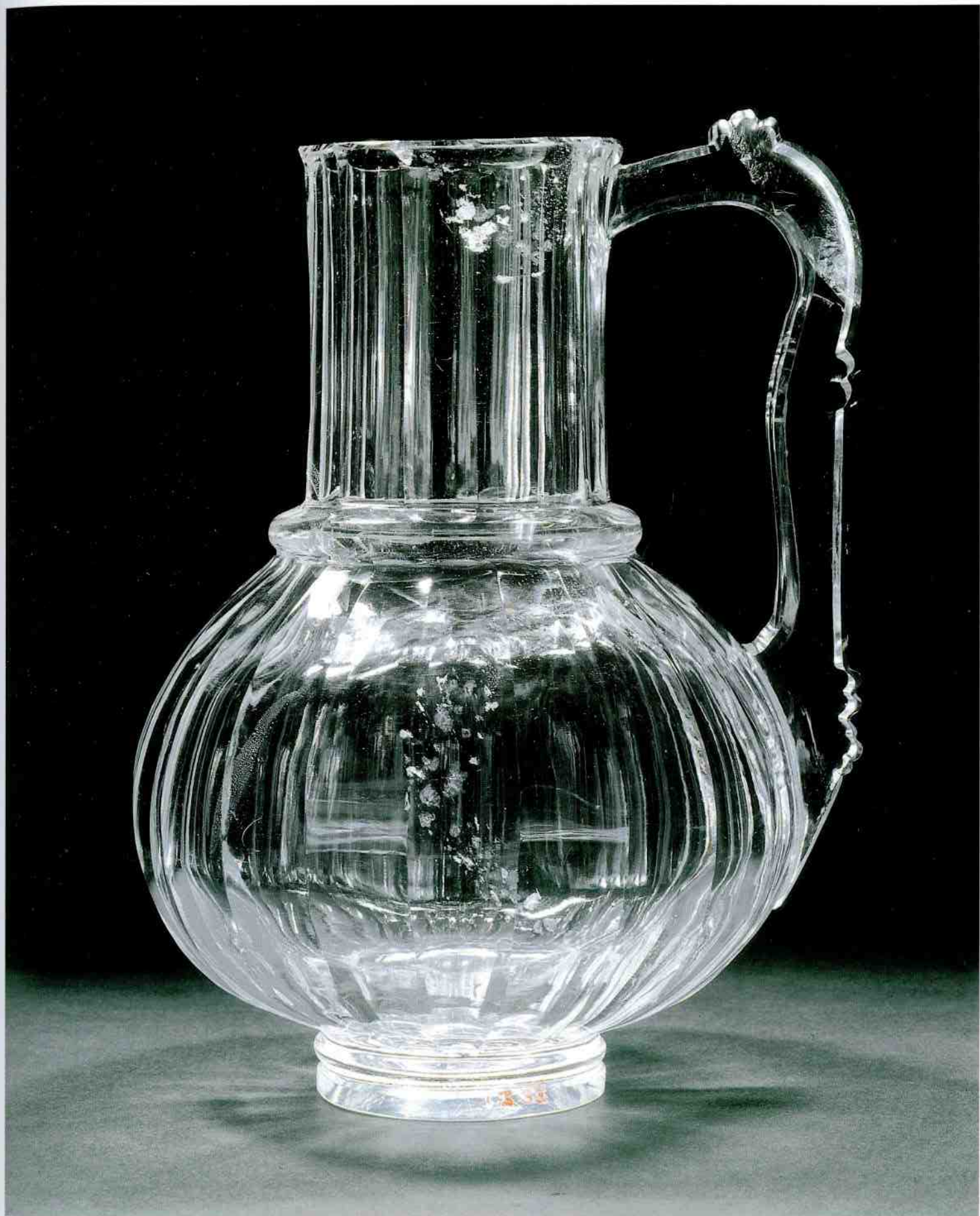
109 (*opposite*) Rock crystal ewer, 12th–13th century, Sicily or 14th-century Burgundian, reworked in the late 17th century, Vienna, h. 18.6 cm. Kunsthistorisches Museum, Vienna (Inv. No. 1513).

110 (*below*) Relief cut glass tumbler, 12th century, Near East or Southern Italy, h. 14 cm. This is one of the biggest and finest "Hedwig glasses," so called because they are said to have belonged to the Silesian Princess St. Hedwig (1174–1245). British Museum, London (1959, 0414.1).

larger fee goes to the assessor, reflecting the superiority of concept over execution (al-Biruni 1936, 184; also Kahle 1936, 332). From Nasir-i Khusraw's remarks on the carving and sale of rock crystal in the Cairo bazaar, we can at least infer that there were commercial workshops most probably producing wares for a variety of customers, and it is reasonable to suppose that their organization and hierarchy were similar to what al-Biruni describes.

Unfortunately, the high level of craftsmanship exhibited by the Fatimid ewers was not sustained in the Islamic world, and from the eleventh century production declined, if without ceasing completely. The craft continued in Byzantine territories, and carved rock crystal (Andaloro 2006, I: 338–39, cat. V.13; pl. 109) and carved glass such as the Hedwig glasses (Tait 1995, 126–27, figs. 158–59; pl. 110) have been variously attributed to Sicily during the second half of the twelfth century and Burgundy during the thirteenth and fourteenth centuries. Later, the craft was revived under Mughal patronage in India⁴—the V&A holds a number of objects from the reign of the emperor Shah Jahan (r. 1628–58), as well as those that show how the tradition of relief carving







111 Rock crystal cup with floral design cut in relief, 18th century, Mughal India, h. 4 cm, w. 5.7 cm, d. 5.7 cm. Victoria and Albert Museum (02611 IS).

112 (*opposite, top*) Horn or tortoiseshell comb with rock crystal handle, gemstones and gold, late 16th–17th century, Ottoman Turkey, h. 6.8 cm, l. 12.7 cm. Dar al-Athar al-Islamiyyah, Kuwait (LNS 7 HS).

113 (*opposite, bottom*) Rock crystal chess pieces, set with emeralds and rubies in lobed gold collar mounts, 16th century, Ottoman Turkey, height of largest 3.5 cm. Topkapı Sarayı, Istanbul (Inv. Nos. 2.1372–2.1373).

continues later, as demonstrated by an eighteenth-century cup (Koezuka 1993, 49, cat. 23; pl. 111). The craft was also practiced in Ottoman Turkey, where, as in the Mughal courts, rock crystal objects were often inlaid with gemstones and gold (Rogers and Köseoğlu 1987, 45). For instance, a sixteenth- or seventeenth-century horn or tortoiseshell comb (pl. 112) has a rock crystal handle⁵ (Atıl 1990, 301, cat. 102; Komaroff 2011, 210, cat. 13, fig. 140), and the treasury of the Topkapı Palace includes a rock crystal chess set inlaid with emeralds and rubies to distinguish the opposing sides (Rogers and Köseoğlu 1987, 206–07, cat. 120; Bernus Taylor 1990; Mackenzie and Finkel 2004, fig. 12.9; pl. 113). In Europe, apart from the workmanship, the properties of clarity and translucency made rock crystal an attractive material for reliquaries (Contadini 2010; pl. 115). The emphasis on bright colors in such later developments stands in stark aesthetic contrast to the play of light upon the unadorned rock crystal of the intricately carved Fatimid ewers.

As Kapstein (2004, Preface, xi) states: “Light may be either physical or spiritual and therefore is an object both of physics and of religious reflection . . . ‘Light’ may literally refer to sensory experience, but at the same time it offers one of our most far-reaching metaphors: knowledge is light, its acquisition enlightenment.” Integral to the reading of these objects is a consideration of their reception, beyond the purely aesthetic, as potential bearers of symbolic meaning. The association of God and light and the notion of divine illumination are ubiquitous, so that one of the questions we face in relation to Middle Eastern rock crystals and the Fatimid ones in particular is whether we are dealing with a substance where the always latent potential of its physical properties for





114. Rock crystal ewer with inscription in kufic script from the Treasury of the abbey of Saint-Denis, late 10th or early 11th century, Egypt, h. 24 cm. Lid: gold filigree; late 11th–early 12th century, Italy. Musée du Louvre (MR 333).

metaphorical play was actuated programmatically, so that in its extreme case its light was held to represent or even embody that associated with the caliph himself. The ancient idea of the divine right of kingship (a doctrine of royal and political legitimacy also very well known to the Byzantines) appears, associated with light, in the writing of the Fatimid court panegyrist and Isma'ili scholar Ibn Hani (d. 973), who conceives the Fatimid caliph al-Mu'izz as a body of light fed by the radiance of the celestial world, with the light he gives forth being on a par with the divine light emanating from God (Canard 1942). But to what extent, we may wonder, did concepts that appear in Fatimid propaganda have purchase on general attitudes to material culture? In particular, could we speculate that rock crystal was widely perceived as a symbolically significant substance, one embodying the properties of light associated with the illumination that the caliph radiated?

Other scholars have detected an analogous perception in relation to the Mughal emperors, suggesting "a concern for adapting religious symbolism, especially elements associated with light and auspicious sight, to an iconography of royalty" (Asher 2004, 161). In support of this connection, reference is made to the tomb of the saint Mu'in



115 Rock crystal ewer, 11th century, Egypt, transformed into a reliquary containing a bone of St. Cesonio, h. (current) 16.7 cm (originally probably 20 cm). Gilded and enamelled mounts, 17th century, German. Cathedral Treasury, Fermo.

al-Din in Ajmer, whose dome was given a marble facing in 1579, while a Persian inscription on the interior points to white marble being a metaphor for God; and to the historian Abu'l-Fazl, who traces Akbar's lineage from Adam through the prophets to a Mughal princess, Alanquwa, who, like the Virgin Mary, is miraculously impregnated by a ray of divine light.⁶

However, the surviving documentation relating to the Fatimid examples fails to suggest parallels for the kinds of inferences detected by Catherine Asher for the Mughals (Asher 2004). Efforts to reconstruct a "period gaze" could call upon theories of the mental processing of sense data as articulated by, say, the Ikhwan al-Safa' or Ibn Sina, but their reflex in later Byzantine texts commenting on images (Damianos 2004) is not matched in the surviving corpus of Arabic texts. Without such a prolongation, they remain too abstract and distant to yield clues as to the specific cultural meanings that rock crystal may have possessed in Fatimid Cairo.

For the Fatimid ewers, it would be safer to consider the evidence of the inscriptions upon them. The one in the Louvre (pl. 114) has a benedictory inscription of a type that is found on many objects in different media and is in no way distinctive (Alcouffe 1991).





117 (left) Detail of pl. 95a.

118 (right) Detail of pl. 97b.

116 (opposite) Rock crystal crescent-shaped piece of the Fatimid caliph al-Zahir; 1021–36, Egypt, set into a European (Venetian?) mount, 14th (?) century, diam. c. 19 cm. Germanisches Nationalmuseum, Nuremberg, KG 695.

That in Fermo (pl. 115) has along its shoulders *baraka wa surur bi'l-sayyid al-malik al-mansur* (Andaloro 2006, I: 131–33, cat. II.9); whether we associate it with a specific Mansur or just read it as “Blessing and joy to the victorious king,” it is simply an expression of good wishes for a ruler. The inscription on the ewer in the Pitti Palace (see pl. 90) does no more than dedicate it to the *qa'id al-quwwad* (commander of commanders), a title held on and off between 1000 and 1008 by the general Abu 'Abdullah al-Husayn, who served under the Fatimid caliphs al-'Aziz and al-Hakim. Rather more substantial is the inscription incised on a crescent-shaped piece (pl. 116), probably used in imperial ceremonies (Contadini 1999 and fig. 1). It includes the name of al-Zahir, the Fatimid caliph who reigned from 1021 to 1036, and ends with *atala allah baqa'ahu*, as standard as “long live the king!” The beginning of the inscription, *li'llah al-din* (To God belongs the faith), strikes a more religious note, and this tenor becomes more explicit in the inscription on the magnificent ewer in the treasury of St. Mark (see pl. 95a): *baraka min allah li'l-imam al-'aziz bi'llah* (blessing from God on the Imam al-'Aziz bi'llah), referring to the famous Fatimid caliph who reigned between 975 and 996. Such expressions remain, nevertheless, stubbornly general, and there is still, even in this last case, no allusion to light, nothing of ideological import that might remind one of Ibn al-Hani's description of the Fatimid caliph. Indeed, the dramatic depictions of animals on the ewers draw us away from anything specifically dynastic and toward the doctrinally neutral visual world of the princely cycle: a lion might signify that this is a ewer fit for a prince (pl. 117), but the metaphorical understanding of a hunting scene, as in the V&A ewer, is unlikely to add notions of spiritual radiance to those of power and domination (pl. 118).

But there are also, even if rare, rock crystal lamps. Given the inescapable reference to the Qur'anic chapter of light (Sura 24), to the lamp with the light inside, one might



119 Bowl fragments, 836–82, Iraq, Samarra, blown, cut, and sanded transparent colorless glass, h. of fragment on the left 6 cm, diam. of bowl originally c. 20.5 cm. Museum für Islamische Kunst (Inv. 606).

readily assume a Fatimid association not merely with divine light but also with that emanating from the caliph. Indeed, following Dawood's 1956 translation of this verse, some scholars have rendered *zujaja* as "crystal" and then by a natural seeming transition have placed rock crystal at the center of the symbology of light to which it gives rise (Shalem 1994, 5). But fundamentally *zujaj* means glass, and while an obvious relationship with rock crystal can be posited, it is surely a question of association rather than identification. At most, one could assume by extension that the symbolic charge of the glass in this verse would encompass also rock crystal, and this equivalence could be supported by the similarity in the way both materials can be treated: clear glass cut in relief was produced at least as early as the ninth century, as Samarra finds show (Lamm 1928, pl. VI; pl. 119), and glass can be thinly shaped and carved in relief in ways very similar to rock crystal. This may be seen, for example, in the Buckley ewer (pl. 120), where the shape and decoration in relief is remarkably similar to the V&A rock crystal ewer (Stanley 2004, 94–95, pl. 107). But cut-relief glass, whether clear or colored, ceased to be produced in the Middle East some time during the eleventh century, being replaced by molded glass (pl. 121), a much more economical technique resulting in lower prices, one so successful that it has survived until today. Blowing the glass bubble, transparent or colored, into a previously carved mold (Lamm 1929–30, I: 58–59, II: pl. 101; pl. 122a–b) allows for objects with pretty relief decorations, albeit rounded rather than sharp, to be produced on an industrial scale.

The notion of equivalence between rock crystal and glass as symbolically charged substances can also be supported by reference to records of early lamps in rock crystal. One example is the Qulayla, the lamp that originally hung in the mihrab of the Great Mosque of Damascus and was taken to Baghdad on the order of the Abbasid caliph al-Amin (r. 809–13), the son of Harun al-Rashid, who is described by al-Ghuzuli (1881–83, II: 284; Shalem 1994, 2) as a lover of rock crystal (*kana yuhibbu al-billawr*). Ibn Jubayr (1145–1217) describes the Qulayla as "a lamp that seems to be of hollow crystal, and like a large drinking vessel" (Ibn Jubayr 1952, 284). It has also been suggested that the splendid Fatimid vessel carved in relief in the Hermitage (pl. 123) was originally a lamp (Lamm 1929–30, I: 1, 199–200, II: pl. 68.5; Shalem 1994, 1, fig. 1; Seipel 1998, 135–37, cat. 109), and similarly the big vase in the treasury of St. Mark (pls. 124–25),

120 (opposite) Buckley ewer, 950–1050, Egypt or Iran, clear cut relief glass, with similar relief decoration as the rock crystal ewer in pl. 97a–c, h. 23.8 cm, w. 9.7 cm. Victoria and Albert Museum (C126-1936).





121 Molded blown glass bottle,
11th century, Iran. National
Museum of Iran.

which may not be Fatimid but earlier (Hahnloser 1971, III-12, cat. 123, pls. XCVI-VII). When seen without its mount (pl. 126), one can see that this was most probably its original function: it would have been attached to the ceiling through wires fixed around the rings of the upper part of the body.

Ibn al-Haytham (1989, I: 336) states: "When the first body is very transparent and the second has weak transparency and a strong color, sight will perceive the second and fail to sense the first because of its excessive transparency," and it is interesting to relate this passage to the lamp in St. Mark's in its European guise, with a silver-gilt mount and precious stones at the top and bottom, added by Venetian goldsmiths in the thirteenth century. As Ibn al-Haytham predicted, the mount is the first thing one perceives, rather than the lighter transparent object. But at the same time the mount has the opposite effect of actually "staging" the object and in this way emphasizing its



122a-b Front and back,
ceramic molds, 10th century,
Mesopotamia, h. 8.5 and 10 cm.
Museum für Islamische Kunst
(Inv. ANT 30660 a + b).

lightness and transparency, thus highlighting the effect already attained by the decision—a stroke of genius—to leave uncarved the middle area between the high-relief decoration of the upper and lower parts.

As for its original function, one can only imagine the wonderful effect that a light inside might have had, with a wick suspended on oil, in the way that it is refracted through the high relief as well as passing directly through the wall of the lamp. Yet there is no reference to any such effect in Ibn Jubayr's prosaic description of the Qulayla lamp, and the fact that, to judge by al-Maqrizi, the Fatimids might have been hugely fond of rock crystal hardly justifies making an explicit connection between its light properties and the religious sphere, and, more particularly, endowing it with a specific symbolic meaning such that, within the context of Isma'ili thought, it could be considered a "dynastic" substance (Makariou 2006, 240).

No evidence has yet come to light suggesting that a state monopoly was imposed upon rock crystal.⁷ It was carved in the Cairo bazaar, pointing to an industry wider than the court. Many of the surviving pieces are utilitarian, as the Geniza documents testify, mentioning small bottles or flasks as perfume or make-up containers, part of the



123 Lamp with mount, rock crystal, c. 11th century, Egypt, l. 22 cm. Mount: late 16th century, Italy, rock crystal, enamel, gilding, carved, polished, and painted. The State Hermitage Museum, St. Petersburg (EG 938).

124 (opposite) Rock crystal lamp, 10th century, Iraq or Egypt, h. 49 cm, max. diam. 17 cm. Archives of the Procurator of the Basilica di San Marco, Venice (Inv. No. 99).

trousseau of a rich bride. Even a piece such as the lamp in St. Mark's has an imposing Arabic inscription in a beautiful kufic script (*dawla da'ima wa ni'ma kamila wa salama li-mawlana*; everlasting power and perfect benefit and success to our lord) that is a formulaic assemblage containing no explicitly religious element.

This is not to say that the lamp could not have been read symbolically. The question, rather, is whether the metaphorical connection with light was programmatic or endemic, a particular facet of Isma'ili thought involving rock crystal that was widely known and accepted in Fatimid society. It would, no doubt, be unreasonable to expect a scientific text such as that of Ibn al-Haytham to deal with light symbolism, but the fact remains that the assertions of Ibn Hani, the Fatimid panegyrist mentioned earlier, are surrounded by a general silence that makes it virtually impossible to reconstruct the "period gaze."

One can, though, consider the question of function: what were the rock crystal ewers used for? Were they on the caliph's table, filled with red wine, or maybe Sicilian tarocco orange juice? Or might water have been more appropriate? As a clear substance it would allow full play to the aesthetic qualities of the vessel, a property recognized by





125 (*left*) Detail of base in pl. 124.

126 (*right*) Rock crystal lamp, as in pl. 124, without mount.

Ibn Haytham when he says: "[For consider] perfectly crafted transparent objects [made of glass or crystal] which ... have been provided with beautiful designs and sculpted figures, and let them be filled with a strong- or dark-colored beverage ... Sight will ... not be aware of their beautiful features ... For, being extremely transparent, their designs will not be visible, or will not appear as they really are." (Ibn al-Haytham 1989, I: 339). This passage may suggest that the beautifully carved rock crystal ewers were not used for a colored beverage like red wine. Water, instead, was regarded as one of the two elements of which rock crystal was compounded, as we have seen. It would thus have a symbolic association with the material of its container, and as a clear, transparent fluid it would have helped the sparkling play of light on the crystalline structure and relief decoration to achieve its full aesthetic effect.

Notes

- 1 This is one of the pieces examined with these techniques at the V&A as part of a new rock crystal project entitled *Line and Light* that I am coordinating with various institutions. Thanks are due here to Mariam Rosser-Owen, Charlotte Hubbard, and James Stevenson for their contribution to the photography and for granting permission to reproduce the images.
- 2 Thanks are due to Ben Gaskell, also part of the *Line and Light* project, who has discussed this with me and has demonstrated the procedure in his workshop. I am also grateful to Ben for permission to reproduce images of his tools and of him carving a piece of rock crystal.
- 3 Analogous distinctions are also found in medieval Europe: the 1284 *regola* (statute) of the guild of rock crystal carvers in Venice indicates the existence of two well-defined specialisms: *l'arte grossa*, which deals with big pieces, and *l'arte minuta*, which is about glyptic art.
- 4 In fact, the carving of rock crystal in India predates the advent of Islam, as it had long been used for objects in Hindu and Buddhist contexts (Haidar 2011, 367).
- 5 It has been suggested that the rock crystal handle is a medieval piece, refashioned with gems according to Ottoman taste (Komaroff 2011, 210, cat. 13, fig. 140).
- 6 It is intriguing to note a more specific reference to rock crystal in this context by Picinelli (1653, Book 12, Ch. 10, 361–62). Referring to the authority of San Bernardo, he states that rock crystal is a symbol of the ideal man as well as of a virgin who, like the limpid bowl of crystal, is pure inside and outside. The sun's rays, passing through a piece of rock crystal, burn everything on the other side that is not pure, but the purity of the virginal uterus of Mary remained intact, even when penetrated by the ray of the divine word.
- 7 Another participant in the *Line and Light* project is Stéphane Pradines, whose archaeological excavations have led to the recent discovery in Mayotte, a small island of the Comoros archipelago in the western Indian Ocean, of blocks of rock crystals of great translucency and transparency, datable by archaeological stratigraphy between the ninth and the twelfth centuries (see Pradines 2013). Stéphane's discovery is in accord with al-Biruni's claims that the best rock crystal comes from the "isles of Zanj." Further research into the area of production including the Comoros archipelago, Madagascar, and the African coast may change our perception of the trade routes and of the control of rock crystal imports. This work in progress will include petrographic analyses that will hopefully help us locate the origin of the rock crystal from which the Fatimid vessels were carved.

*God Is the Light of the Heavens
and the Earth*

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Endpapers: detail of carved brick decoration on the Hongshuiquan Mosque, Ping'an, China.

Pg. ii: Detail of Shirin Neshat, *Fervor*, 2000, production still.

Pg. iv: detail of "Iskandar visits the hermit by night," from an *Anthology* made for Iskandar Sultan, Jumada II 814/September–October 1411. British Library, London (ms. Add. 27261, fol. 230a).

Pg. vi: detail of Hall of the Abencerrajes, Alhambra, Granada, 14th century.

Pg. viii: detail of illuminated heading from the copy of Firdawī's *Shahname* made for Shah Tahmasp, c. 1520–25, Museum of Contemporary Art, Tehran.

Pg. x: detail of courtyard in the complex of Sultan Hasan, Cairo, 1361.

Pg. xii: detail of Junayd, "Humay, on the day after his wedding, has gold coins poured over him as he leaves Humayun's room," from Khwaju Kirmani's *Three Poems*, 798/1396. British Library, London (ms. Add. 18113, fol. 45b).

Pg. 358: detail of Levni's "Firework displays at the Ok Meydan," from a copy of Vehbi's *Surnâme*. Topkapı Palace Library, Istanbul (ms. Ahmed III 3593, fol. 52a).

Pg. 361: detail of transverse vault in the west prayer hall of the Friday mosque at Yazd, 1364–76.

Pg. 363: glass mosque lamp with enameled and gilded decoration, c. 1360. Freer Gallery of Art, Smithsonian Institution, Washington, D.C. Purchase (F1957.19).