

To say that diamond is the king or queen of gems is not modern hyperbole. Two thousand years ago, the Roman writer Pliny the Elder told his readers that diamond was so rare it was the preserve of kings; a millennium later, the medieval Persian writer al-Bīrūnī said that diamond's position among gems was like that of a king among his subjects. Pliny and al-Bīrūnī are just two of many writers who have discussed the properties of diamonds at length. Some of what they have said is remarkably scientific, some fanciful. For the modern gemologist, the properties that define a gem are rarity, durability, and beauty. Ideas of beauty may have changed since the days of Pliny or al-Bīrūnī, but they would recognize the importance of rarity and durability. Rarity and hardness have made diamond a symbol of power, invulnerability, and ultimately love. Diamond is the hardest naturally occurring substance, and its name reflects this. "Diamond" and its European variants, such as *diamant* and *diamante*, derive via Latin from the ancient Greek *adamas*. In Greek, *dama* had the sense of "conquer" or "tame." The addition of the Greek negative prefix *a-* made it *adamas*—unconquerable or invincible, a suitable name for this exceptionally hard material. In medieval Europe, this prefix disappeared, and we begin to find references to *dyamon*, *diamans*, and other variant spellings, eventually standardized in English as "diamond." This chapter will explain something of diamond's unique nature and how it occurs, and then look at some of the myth and symbolism that has been attached to it, and why.

The Occurrence, Form, and Properties of Diamond Diamond is formed deep within the earth and is unique among gems in being composed of a single chemical element, carbon, in a compact, crystalline form. This simple composition and Figure 1.1. Diagram of an octahedral diamond crystal showing how it can split ("cleave") in directions parallel to a crystal face. Drawing: Jack Ogden. Figure 1.2. Detail showing an uncut, octahedral diamond in a Roman gold ring, third century AD. Credit: The British Museum, 1917,0501.788. © The Trustees of the British Museum. All rights reserved. Photo: Jack Ogden. 2 • The Diamond structure makes diamond hard and highly resistant to chemical attack. Some diamonds thus survive the extreme conditions of the volcanic activity that transports them to the surface of the earth where millions of years of erosion can leave them in the sands and gravels of past or present river valleys. These riverbed or "alluvial" diamonds are found in various parts of the world, but until the 1600s India was by far the most important, if not the only, source of diamonds for the Mediterranean and European worlds. The textbook shape of a diamond crystal is an octahedron, like two square-based pyramids base-to-base (figure 1.1). Indeed, several Renaissance travelers described the shape of the pyramids of Egypt as being like pointed diamonds (Hakluyt 1599, 417; Lithgow 1614, n.p.). Early Indian texts and the Roman writer Pliny described this octahedral form, and we can see natural, octahedral diamond crystals set in ancient and medieval rings, such as the Roman ring in figure 1.2, which dates from the third century AD. One of the earliest illustrations of octahedral diamonds is in a Franco-Flemish manuscript of about 1270, where four diamonds can be seen in a rocky outcrop (figure 1.3). 1 A century later, an early travelogue written by "Sir John Mandeville" (probably a fictitious name) gives a charming description of a natural octahedral diamond crystal as "square and pointed of here owne kynde, bothe aboven and benethen, with outen worching of mannes hande"—that is, "square and pointed of her own kind, both above and beneath, without working of man's hand" (Halliwell-Phillipps 1839, 158).

Although the octahedral form is the most iconic shape of diamond crystal, other crystal forms occur and few are perfect octahedra. A group of diamond crystals is shown in figure 1.4. An old

example of a particularly irregular form is the large brown diamond in the Late Roman ring in figure 1.5, which is an intergrowth of two diamond crystals. At about seven carats (1.4 grams), this is by far the largest diamond I know from the ancient world (Ogden 1973b). The brown color lacks the attraction of modern “fancy colored” diamonds, but it is also a reminder that diamonds do occur in various colors, with the more attractive ones now demanding very high prices. In the past, color was often referred to as “water,” with a perfectly colorless gem described as of the best water, while one with a slight yellow cast might be described as having a yellowish water. Some diamonds were broken during their long geological history. Although highly resistant to scratching, diamonds can break under impact or pressure, splitting along specific directions relative to their crystal structure (see figure 1.1). This susceptibility to splitting is taken advantage of in the process called “cleaving,” which can be used as a preliminary to cutting in order to remove a badly flawed area of a diamond crystal, trim one to a more suitable shape for cutting, or allow the production of two or more cut stones from a single crystal. All diamonds as found in nature, regardless of the completeness or perfection of their crystal form, are referred to as “rough diamonds.” Ancient observers were intrigued by crystals in general and speculated on how they formed. Renaissance philosophers believed gems were some sort of congealed liquid or “juice.” Thus, the seventeenth-century French philosopher and Catholic theologian Antoine le Grand explained, “A Diamond sparkles the brightest of all other Precious Stones, and strikes the Eye with the most brisk and dazzling splendor. The Reason is, because it consists of a most pure Juice, whose parts are so divided by straining, that they Reflect and Refract the Rays they have received from all sides of them” (le Grand 1694, 130). This latter comment is probably a reference to the remarkable “fire” in a diamond, the rainbow hues caused by the way in which light passing through a diamond is broken up, much as light passing through a prism is separated into the colors of the rainbow. This effect is referred to technically as the dispersion of a diamond, and modern faceting is designed to best show it off. The effect is seen with a well-shaped, clear diamond crystal and was noted from an early period. The *Garuda Puranam*, a Sanskrit book that probably dates to the fourth or fifth century AD and was certainly in existence by the tenth, explained dispersion with a mystical flavor. “A diamond scintillating with flashes of rainbow colored hue at the center . . . blesses its wearer with a prosperous family and well-filled granaries . A king wearing a diamond dazzling with lightning flashes, is sure to subdue the prowess of his neighboring monarchs and to exercise an unbounded control upon his vassals and liege subjects” (Dutt 1908, 186). The medieval Persian sages al-Bīrūnī and Nishābūrī, the latter better known in the west as the poet Omar Khayyam, were among those who explained how the effect could be seen if a diamond crystal was stood upright in the sunlight, using a bit of wax to support it (Said 1989, 76; Nishābūrī 2004). The presence of a clear rainbow effect proved the stone was a good one. A few centuries later in England, Thomas Nicols seems to be describing dispersion in a diamond when he says, “It will snatch color and apply it and unite it to itself, and thus will it cast forth at a great distance its lively shining rayes, so that no other jewell can sparkle as it will. By this excellent emission of its rayes or beams, or by this generous sparkling forth of its glory, do the most judicious Jewellers distinguish the true Diamond from those of bastard kinds” (Nicols 1652, 46). Clarity The quality of a diamond has also been long defined by its clarity—that is, the absence or presence of internal features such as small fissures or inclusions. The most widespread approach to diamond grading today, that developed by the Gemological Institute of America (GIA), in part quantifies clarity on the basis of what is visible using a magnifying glass with ten-times magnification. Awareness of these internal features and their categorization as defects

is not new. Early Indian texts explain how “crows’ feet” and other marks render diamonds less efficacious, while seventeenth- century Europe an documents use picturesque terms such as “icicles” and “clouds” to describe the interior features that can lower a diamond’s value. In the seventeenth century, Sir William Petty recommended that those with less than perfect eyesight use a microscope when assessing the value of a diamond (Ogden 2012). Arguments for a practical use of magnification in the ancient world include the various transparent objects that have survived from antiquity that could in theory have acted as lenses. Lenses cut from crystal used to light fires or cauterize wounds were certainly known in the ancient Greek world. The dialogue in Aristophanes’s *The Clouds*, written in 419 BC, includes Strepsiades asking Socrates, “Have you ever seen a beautiful, transparent stone at the druggists’, with which you may kindle fire?” and Socrates replying, “You mean a crystal lens.” Three centuries later, the Roman philosopher Lucius Annaeus Seneca (ca. 4 BC–AD 65) commented in his *Natural Questions* (1.6), “Letters, however small and dim, are comparatively large and distinct when seen through a glass globe filled with water” (Clark 1910, 29–30). On the other hand, not a single classical writer mentions magnification as a practical tool for any craftsmen, let alone lapidaries or jewelers. However, there is a tantalizing statement from further east. The *Garuda Puranam* says, “A diamond found to be affected with small defects whether visible or invisible to the naked eyes, should be appraised at a price equal to a tenth part of that of a diamond of similar water and weight, but devoid of all such blemishes.” How might a defect “invisible to the naked eye” be taken into consideration unless magnification was available? A mid- fourteenth- century fresco in the Basilica of San Nicolò in Treviso, northeast Italy, shows a magnifying glass used to read a book, but there is no evidence that magnification played any part in the day- to- day trade in diamonds prior to the seventeenth century, and even then it was probably uncommon. We begin to see people, including jewelers, wearing glasses in Renaissance paintings, and in 1620 an Englishman, Francis Bacon, mentioned the possibility that a microscope might be useful for examining “the latent minutiae and irregularities of gems” (Bacon and Montagu 1831, 14: 160). From about this same period we have the earliest representation of a magnifying glass for looking at jewelry (figure 1.6). This is a drawing by François Pelgrim of Antwerp sent to the Dutch jeweler Arnold Lulls, who relocated to London in 1585. This equipment consisted of a large circular lens suspended from cords that could be raised or lowered by means of a pulley system.

Diamond Symbolism It is not surprising that rare, transparent, shiny, and often attractively shaped diamond crystals became coveted by the rich and powerful. The hardness of diamond made it a symbol for steadfastness and invincibility, whether this represented royal power, the walls of Jerusalem, or true love. Early Indian texts are the most effusive about the powers of a diamond and make it clear that the better the quality of the stone, the more powerful it was. For example, the *Garuda Puranam* says, “Serpents, tigers, and thieves fly from the presence of a person wearing such a diamond” (Dutt 1908, 104). The text goes on to assure us that “a wearer was protected from fires and floods, would have a healthy complexion and all his undertakings would thrive.” The masculine pronoun is noteworthy; some Indians may have scorned the modern idea of a diamond as a girl’s best friend. As the *Garuda Puranam* also says: “Diamonds are prohibited as articles of female wear, as they are possessed of the mystic virtues of making them sterile and unhappy” (Dutt 1908, 185).

Diamonds as a Symbol of Love Despite some early Indian views on diamonds and women, the extreme hardness of diamond that had linked it with unconquerable kings also eventually made it the symbol of unwavering love. Today, from San Francisco to Shanghai, diamond is the predominate gem of choice in engagement and wedding rings. Cynics may complain that this

“tradition” is an invention of modern marketing, but they are wrong. In the West, diamond rings have been a part of some betrothals for many centuries; indeed, in the mid- 1600s Thomas Nicols said that the hardness of diamond meant that it could “be used symbolically as a signification of constancy” (Nicols 1652, 17). The diamond- set ring of Mary of Burgundy in figure 1.7, with her initial M delineated in what are now called hog- back diamonds, as discussed in Chapter 5, is often said to have been her betrothal ring when she married Maximilian I of Austria in 1477. There is no actual evidence for this, but a diamond ring certainly played a part in her preparations for betrothal. On her father’s instructions, she wrote a letter to Maximilian’s father promising that she would marry his son, and her father enclosed a diamond ring “of considerable value” as a sign of sincerity. In 1475, just two years before Maximilian and Mary were married, the wedding took place of Constanzo Sforza and Camilla D’Aragona, from two of the most influential families in Italy. A poem celebrating this union includes the words “Two wills, two hearts, two passions are bonded in marriage by a diamond.” An accompanying drawing shows a diamond ring encircling two burning torches and an attendant figure identified as Hymenaeus, the old Greek god of wedding ceremonies, wearing a robe embroidered with diamond rings and flames. We can find an earlier mention of a diamond ring with love connections in England. The will of a wealthy widow, Johanna Fastolf, who died in 1417, includes a diamond ring inscribed “[Je] Vous aime de tout moun coer” (“[I] love you with all my heart”) (Sharpe 1890, 419). It is just possible that this referred to her devotion to God, but it seems far more likely that it reflected the affection of her former husband and was her betrothal or marriage ring. Other fifteenth- century diamond rings that may have been betrothal rings include an Italian gold ring now in the British Museum, shown in figure 1.8. The inscription here says “Lorenzo a Lena Lena” (from Lawrence to Lena Lena) (Ward et al. 1981, 197). A diamond ring of the previous century, if not slightly earlier, also in the British Museum, might have been a love gift since it is inscribed “here in place of a friend” (O. M. Dalton 1912, no. 1006). A ring set with “a dyamond and a rubie” is noted in the 1505 will of Marion Chamber of Bury in England, where it is specifically described as a “maryeng ryng” (Tymms 1850, 25). This suggests that the various surviving medieval rings with paired diamonds and rubies, such as the ring in figure 1.9, were also wedding rings. This ring was found by a metal detectorist near Launde Abbey, Leicestershire, England.² It may be thought sexist today, but half a millennium ago it would have been perfectly reasonable to identify an invincible diamond with the man, and a red gem, the color long associated with fertility, with the woman. Once into the 1600s, we begin to see more evidence of diamond rings associated with marriage, both with surviving examples and with mentions in literature. The latter include a romantic short story, *The Two Damsels*, written in 1613 by Miguel de Cervantes, of *Don Quixote* fame. Here a diamond ring is described as being engraved with the words “Marco Antonio is the husband of Theodosia.” A half century later, in 1664, Jean- Baptiste Poquelin, better known as Molière, wrote the play *The Forced Marriage*, in which a man seeks to buy a diamond ring for his intended spouse. The Goat’s Blood Myth One of the most ancient and firmly embedded of myths about diamond is that it could only be broken after steeping in goat’s blood. We first find this mentioned in Roman times when recounted by Pliny around AD 70 and then, a century later, by the Greek traveler and geographer Pausanias in his *Description of Greece* (8.18.6). The latter tells us that “diamonds, the hardest of stones, are melted by the blood of the he- goat.” It is unclear where Pliny might have heard the story since, as the anthropologist and historian Berthold Laufer pointed out, it is seemingly not encountered in Indian tradition (Laufer 1915, 6). In 1491 the first edition of an early printed medicinal handbook, the *Hortus Sanitatis* (Garden of

health), was published in Mainz. The compiler is uncertain, but the work is generally attributed to Johann Cuba and includes a section on minerals. An illustration that accompanies the description of diamond based on Pliny's comments shows a man seated at a table, on which is what appears to be a dish of diamonds soaking in goat's blood (figure 1.10). It also shows diamonds resisting fire and a diamond-tipped lapidary tool. Proceeding through the centuries, we find Pope (later Saint) Gregory the Great (540–604) saying that “hard diamond admits not at all of incision by steel, but is softened by the mild blood of goats” and so on into the Middle Ages (The Book of Pastoral Rule, 3:13). Over the years, the story became more involved, eventually defining even the best diet for the goat. This supposed susceptibility to goat's blood has been discussed by numerous writers since, and once science dethroned superstition, the story has usually been dismissed as nonsense. The first to refute it was the thirteenth-century Franciscan friar Roger Bacon, but it was still several centuries before skepticism became the norm. In his 1606 text *Gouldesmythtes Storehouse*, the London jeweler Hannibal Gammon repeats the story that diamonds can only be broken with use of goat's blood, but says, “but it is not soe” (Gammon 1606, 66r). In 1658 Thomas Browne included the supposed use of goat's blood to break a diamond among his “common Tenents, concerning minerall and Terreous bodies, which examined, prove either false or dubious” (T. Browne 1658, 91–92). More recently, an anonymous mid-nineteenth-century correspondent to *Notes and Queries* magazine suggested, “Its origin would seem to be simply that necessity for lying which is inherent in Asiatics.”³ However, a myth must start somewhere, and perhaps here the most obvious origin would lie in some rite or sacrifice. To break the “unbreakable” diamond was surely an inauspicious act in ancient India, and the sacrifice of a goat could well have been a way to propitiate the gods or spirits. We have no evidence for this, but Robert Forbes, a specialist in the history of technology, discussed at length the rites, superstitions, and even sacrifices that accompanied metalworking in antiquity and in some recent “primitive” societies, and one might expect no less with breaking diamonds (Forbes 1971, 71–80). More prosaically, crushing diamonds to produce chips for lapidary work required some way to stop the minute chips flying off and being lost. Some type of enclosing paste could serve. Might blood act like a paste in keeping the diamond fragments together? Another possibility is that something that looked like blood was used. There is a Sanskrit recipe for diamond dust for use in medicine that describes mixing beaten cotton plant with the juice of the betel nut. “The diamond is enclosed within this paste and roasted in a pit of fire. The process is repeated seven times, when the stone is easily reduced to a fine powder” (Dutt and King 1877, 92). Betel juice has a blood-like appearance. Consider this 1967 advice from the United States Marine Corps Unit Leaders Personal Response Handbook written for U.S. military personnel serving in Vietnam and likely to encounter betel-nut chewing: “Unless forewarned of this colorful habit, when you first see it, you may think the chewer has a serious chest wound or, at the very least, is spitting up excessive blood.” Perhaps inevitably with the early Christian writers, the blood of a goat that could subdue the unconquerable diamond became the blood of the Lamb of God. Indeed, early Christian writers repeat or seek to outdo Old Testament allegory when they compare the hardness of diamonds with the invincibility of the soul, true faith, and the like. St. John Chrysostom (AD 347–407), for example, was particularly prone to using diamond in an allegorical sense in his copious writings. St. Paul was “bold in the face of fire, hard as diamond, firm and unshaken,” “he who strikes a blow upon the diamond, gets the shock of the blow himself,” and the firm soul “is stronger even than a rock and harder than diamond,” to quote but a few.⁴ When diamond was first cut in later medieval Europe, it had been considered invincible for some two millennia. It seems

strange this didn't attract a church backlash. To finally bend diamond to the will of man surely overthrew God's order; it was impudence at best, blasphemy at worst. Lead and Diamonds Blood was not the only substance that was supposed to facilitate the breaking of diamonds. Medieval writers repeatedly noted that diamond could only be cut by means of lead. Since lead is very soft and diamond very hard, this phenomenon was regarded as magic by medieval European minds, as a silly myth by later ones. This was neither magic nor myth: it was a misunderstanding. The ancient use of diamond chips to drill and engrave other gems is well established (see the next chapter), and their manufacture was not complicated. Diamonds are relatively brittle despite being extremely hard, and could be broken with a hammer. The problem was that, as Pliny warned, these splinters could be so small as to be almost invisible (Natural History 37.15). One way to avoid loss was to wrap the diamond in a piece of lead prior to hitting it with a hammer. Al- Bīrūnī explained that this prevented the little splinters "from falling and dispersing" (Said 1989, 79). Later Muslim writers—and others—said much the same. For example, the thirteenth-century Persian writer Mohammed ben Mansur explained how diamonds could be broken by wrapping them in lead and then hitting this with a hammer (Hammer 1818, 346). The Armenian historian Arake'l of Tabriz similarly explained to his readers, "The diamonds are crushed, remain embedded in the lead, and do not scatter" (Bournoutian 2006, 447). Both he and Mansur added that wax or resin could be used in a similar way—the wax with trapped diamond particles would be put in boiling water, where the wax melted and floated and the diamond particles sank. A paste made from horn shavings could also be used, it was said, and possibly therein lies the origin of another ancient "myth," that diamond could be broken with a ram's horn (Dutt and King 1877, 92).

Diamond as Poison Another property commonly attributed to diamond in the past was its effectiveness as a poison. Even the Renaissance goldsmith Benvenuto Cellini was fearful that he might be poisoned this way. However, there seems to be no toxicological basis to this anxiety. In the eleventh century, al- Bīrūnī cast scorn on it. First, he noted an obvious practicality: "If it has not been ground well, it will be betrayed by the teeth of the eater." This is perhaps the earliest reference to the grinding of diamond to a fine powder. Al- Bīrūnī then cites a scientific experiment: "A dog was administered the diamond. It was affected neither at the time nor was any effect noted later. It is all idle talk, without any substance." Even so, according to Sir Jerome Horsey, a sixteenth-century English politician who traveled to Moscow as an agent for the Russia Company, Ivan the Terrible had commented, "The least parcel of it [diamond] in powder will poysen a horse."⁵ The sixteenth-century Portuguese doctor Garcia de Orta would not have agreed. He quotes the case of a woman who, fed up with caring for her sick husband, tried to poison him with ground-up diamonds, but without success (Markham 1913, 344). De Orta's contemporary, the sixteenth-century Italian mathematician, physician, astrologer, and philosopher Girolamo Cardano, pointed out that people had swallowed diamonds in order to steal them without "the least impairing of their Healths" and that even a quantity of diamond powder had been swallowed "without prejudicing the Health of the Taker, any more than if he had eaten so much Bread" (quoted in le Grand 1694, 130). One of the last recorded attempts at poisoning by diamond powder in Europe occurs in a complex scandal involving infidelity and murder among the English aristocracy in the early seventeenth century. Anne Turner was a businesswoman with court connections who both ran a house of ill repute and was "waiting woman" to Frances Howard. Frances, although the wife of the Earl of Essex, was in love with King James's favorite, Robert Carr, first Earl of Somerset, and she wished her marriage annulled so she could marry him. Carr's secretary and adviser, Sir Thomas Overbury, disapproved of the match, so

Frances plotted to kill him. Anne Turner put Frances in touch with an apothecary named James Franklin to obtain poisons, and she asked him “whether he knewe the powder of Diamonds. He said noe, and she said he was a foole, and bad him git some of it from the cutters of Diamonds, and al he could whatsoever it cost.” Various poisons were tried; at least one worked, and Sir Thomas Overbury died in September 1613. In what might be evidence of different justice for the rich than for the poor, Anne Turner was hanged on 15 November 1615, and Frances Howard, by then Lady Somerset, was pardoned (Owen 1971, 23). The best short refutation to the toxicity of diamond of more recent date is that by an anonymous correspondent to *Notes and Queries* in 1875 who said, “The only possible way in which it [diamond powder] could be injurious would be as a mechanical irritant to the mucous membrane of the stomach.”⁶ Even so, the diamond dust as poison myth had to start somewhere, presumably in the East, and we might suspect that as diamond powder was a valuable commodity and easy to steal, fear of poisoning would be an effective security measure against concealing a small amount in the mouth. Diamonds have been recognized by man for perhaps two and a half millennia—a mere blink of an eye compared with the billions of years since they were formed. The nature of their composition and creation explain their exceptional properties, particularly their hardness and optical qualities. This unparalleled hardness prompted their original use as a lapidary abrasive, spawned many long-lived myths, and established them as an emblem of power and constancy. The most perfect crystals would have had something of the shine and rainbow “fire” that we associate with diamonds today, but their true sparkle was revealed only after cutting and polishing developed. The following chapters will chart the history of the mining, trade, and use of diamonds and attempt to untangle the development of their cutting. Today, diamonds are far commoner than the jewelry industry might be prepared to admit, but for the period covered by this book, they were rare and coveted, truly the king of gems. The earliest published diamond-set piece of jewelry of which I am aware is a ring found in 1999 at Ai Khanoum, ancient Eucratidea, in the northeast of what is now Afghanistan (figure 2.1; Bopearachchi and Flandrin 2005, 111–12). Ai Khanoum was probably founded in about 280 BC after Alexander the Great partitioned his empire. It was one of the most important cities in Greco-Bactria, and the magnificent finds excavated there are evidence for extensive trade with both the Greek world and India. The center stone in the ring is a pink sapphire, almost certainly from Sri Lanka. This is flanked by two small octahedral diamond. The Ancient World crystals, diamonds in their natural form. Despite the Indian origin for the diamonds and the likely Sri Lankan origin for the pink sapphire, the Ai Khanoum ring is not in Indian style. It is a Greek type with early Hellenistic Greek filigree. The implication is that this ring was made by a Greek goldsmith working in Ai Khanoum and incorporating gems traded up from the south. However, neither diamonds nor pink sapphires have been found so far in jewelry of such early date from the Mediterranean or Near East. In these areas, the earliest evidence we have for diamonds is their use for the working of other gem materials. This chapter will consider this early use of diamonds for what we might term industrial purposes, and then trace the first use of diamonds in jewelry in the Mediterranean world in Roman times. The Roman admiration of diamonds was served by their trade with India, both overland and via the Indian Ocean until this was largely curtailed by the rise of Sasanian Persian power and then Islam. Diamond Chips in Lapidary Work Diamonds, as we have seen, can be broken into chips and splinters despite being extremely resistant to scratching; in gemological terms, diamonds are exceptionally hard but not tough. In the mid-1970s, two American researchers, Leonard Gorelick and John Gwinnett, an orthodontist and a professor of oral biology and pathology, respectively,

became intrigued by the drilling of stone beads in antiquity. They used the scanning electron microscope to study silicon- rubber casts of the interior of these drill holes and were able to establish the diagnostic appearance of various drill types. In particular, they found perforations in ancient hard stone beads with identical characteristics to those produced by the hand- operated, diamond- tipped drills still used in northern India (Gorelick and Gwinnett 1988). The earliest evidence they found for diamond- tipped drills was from the Yemen dating from around the seventh to fifth centuries BC (Gwinnett and Gorelick 1991). In early times, the Yemen was an important center of the coastal sea trade between India and the Red Sea, so the beads may have been worked there or brought ready- drilled from India. The breaking of a diamond into usable chips required something hard and tough with which to hit or crush it. It might not be coincidence that the earliest evidence we have for diamond chips in lapidary work dates back to about the same time as the earliest steel—the so- called wootz crucible steel developed in India around 600 BC. From about this same period we have the earliest use of diamond chips for drilling beads in India, fitting in well with the Yemeni date (Law et al. 2013, 180). At about the time the Yemeni beads were made, the prophet Jeremiah in Judah penned the often- quoted biblical verse “Your sin, O Judah, is written with a pen of iron and [or perhaps ‘with’] the point of a diamond” (Jeremiah 17:1). The word translated here as “diamond” is the Hebrew *shamyr*, a word then applied to materials where hardness rather than sharpness was implied. Thus, Zechariah described hearts being made like *shamyr* (Zechariah 7:12). *Shamyr* might have included the abrasive emery (and is probably the origin of the Greek word for emery— *smyris*), but it is tempting to compare Jeremiah’s “pen of iron with the point of a diamond” as used to engrave a stone tablet with the iron stylus with the diamond- set tip that the Roman writer Pliny later described for engraving gemstones. Similar instruments were used by Mughal Indian lapidaries and Chinese jade workers, and are still used today by engravers of precious stones. The implement held aloft by the man in figure 1.10 is probably intended as a diamond- tipped lapidary tool. Around the time the Roman writer Pliny died in the eruption of Vesuvius in AD 79, the Roman poet Publius Papinius Statius began to write his twelve- book epic the *Thebaid*, which recounted the story of Oedipus’s sons’ battle for the throne of Thebes. This complex Latin text includes an unclear description of an ornament incorporating emeralds and somehow set or decorated with *percussum adamanta figuras* (bk. 277). *Percussum* comes from the verb *percutio*, typically meaning to beat or strike, like the modern percussion, so one reading might be that the emeralds were engraved with figures using broken chips of *adamas*. If so, this ties in with Pliny’s mention of the lapidary use of diamonds. There is no evidence for the use of the diamond as a gem in biblical times, and accepting that the second row of gems in the Jewish high priest’s breastplate, as described in the book of Exodus (28: 18), included “an emerald, a sapphire, and a diamond” is greeted with greater skepticism today than when stated in the King James translation of the Bible published at the beginning of the seventeenth century. Diamonds in the Greek World When we look to the Greek world, our understanding of early acquaintance with diamond is hampered again by translation problems. The Greeks applied the word *adamas*, meaning “unconquerable” or “unalterable,” to substances characterized by their great hardness, perhaps including early steel. In the fourth century BC, the Greek philosopher Plato mentioned *adamas* twice. He refers to “the precious substances which are mixed with the gold and akin to it and can be removed only by fire— copper, silver, and sometimes *adamas*, ” and says, “the offshoot of gold, excessively hardened and dark colored by reason of its density has been called *adamas*” (Plato, *Politicus* 303e; Plato, *Timaeus* 59b). Diamonds are found with gold, but this is rare, and it is

more probable that Plato was describing the very hard natural alloy grains of members of the platinum family of metals, typically osmium and iridium, as are common in alluvial (water- borne) gold deposits. Most ancient methods of gold recovery and treatment did not remove these little grains, and so they can be seen as silvery- gray specks in a significant proportion of ancient gold objects (figure 2.2). A few centuries later, the Roman author Gaius Plinius Secundus (AD 23–79), known as Pliny the Elder or usually just “Pliny,” described these same *adamas* grains found with gold with remarkable accuracy (see below). The well- defined thin lines we begin to see in Greek engraved gems from around the late sixth century onward—for example, indicating lyre strings or chariot- horses’ reins—are likely candidates for the use of a diamond point in engraving. Also, from about this time onward, some of the better- quality Greek intaglios show traces of fine scratched lines used to lay out the design, almost certainly produced with a diamond point. The American gem specialist George Kunz came to a similar conclusion: “It is possible that the stone [diamond] was employed in engraving in the fifth century BC” (Kunz 1913, 294). In the latter part of the fourth century BC, Alexander the Great of Macedon embarked on his conquest of the Persian empire, which took him at least as far east as the Indus. In the wake of Alexander’s expedition, pearls from the Persian Gulf, emeralds from Egypt’s Eastern Desert, and garnets from India began to reach the Hellenistic Greek world in increasing numbers to be set in gold jewelry. The influence of Alexander the Great’s expeditions and conquests on the trade in gems from India is reflected in the ancient legend of Alexander the Great and the Valley of Gems, a myth that, as we will see, resonated through history, reappearing in various guises and with various other proponents, from Sinbad to Marco Polo. A couple of centuries after Alexander, development of direct rather than coastal sea trade with India began, made possible by the exploitation of the monsoon winds. The Greek historian Strabo attributed this navigational discovery to the navigator Eudoxus of Cyzicus, who explored the Indian Ocean for the Egyptian pharaoh Ptolemy VIII (ca. 182–116 BC) and who indeed returned from his voyage to India with “precious stones,” although he doesn’t specifically mention diamonds (Strabo, *Geography* 2.3.4). Indeed, despite Egypt’s important position on the sea route east, I am not aware of any mention of diamonds in Egyptian texts from this period. The Arabist and explorer Sir Richard Burton, in his translation of the *Arabian Nights*, says that according to Athanaeus of Naucratis in his *Deipnosophistae*, “The Indians brought pearls and diamonds to the procession of Ptolemy Philadelphus” (Burton 1885–88, 9:325). This was the great procession of Ptolemy II in 258 BC, but I have been unable to find any specific mention of diamonds (or pearls) in the original text, although there are more general references to “precious stones.” Theophrastus, a Greek philosopher from the island of Lesbos, was a friend of one of Alexander the Great’s generals, perhaps of Alexander himself. Around 300 BC he wrote a book titled *On Stones*, in which he mentions a substance named *adamas* (Theophrastus, *De lapidibus* 19). Unfortunately, this mention is short and oblique. He seems to cite similarities between what he calls *anthrax* and *adamas* in their angular form or their resistance to heat, or both of these. Possibly here *anthrax* was the lapidary abrasive *emery*, and if so, his *adamas* might have applied to diamond chips used in lapidary work. There is no clear indication that Theophrastus considered *adamas* to be a gemstone; nor does he say that *adamas* came from India. The early Roman poet Ovid (43 BC–AD 17/18) continued the Greek practice of applying the term *adamas* to hard and mythical materials. For example, the chain holding the ferocious three- headed dog of the underworld, Cerberus, was of *adamant*, and Zeus changed *Celmis* into *adamas* when he offended Rhea, the mother of the gods (*Metamorphoses* 4.281, 7.412). However, there must have been a growing awareness of

what we would recognize as diamond. Pliny's Adamas When Julius Caesar defeated Mark Anthony and Cleopatra at the Battle of Actium in 31 BC, the Roman destruction of the Hellenistic kingdoms established by Alexander the Great three centuries earlier was complete. With Roman trade connections growing alongside the Roman love of luxuries, it is hardly surprising that the earliest surviving examples of diamonds we have so far in jewelry in the European and Mediterranean worlds are from this period. The earliest Roman mention of a true diamond I am aware of is by the poet and astrologer Marcus Manilius in the early first century AD. He explained that "diamond, a stone speck [punctum], is more precious than gold" (*Astronomica* 4.926). Perhaps he was talking about diamond points for stone working rather than set in jewelry, but from just a few decades later we have the comprehensive description written by Pliny, a Roman naval and military commander as well as a natural historian of considerable ability. He wrote thirty- seven books on natural history, the final volume of which dealt with gemstones. In this work, which became the standard text on gems for a millennium, he explains, "The most highly valued of human possessions, let alone gemstones, is the adamas, which for long was known only to kings, and to very few of them" (Pliny, *Natural History* 37.15). Again, this is a clear indication that diamonds were considered gems since kings are unlikely to have coveted gem- working tools . Pliny's description of adamas is extensive and drawn from various sources. He describes six varieties of adamas, just two of which were "true" adamas, "the most highly valued of human possessions." The first of these was the Indian adamas that resembled rock crystal. It was transparent, had smooth faces meeting at six corners, and tapered to a point in two opposite directions—a good description of a typical octahedral diamond crystal. Such a crystal, he says, could be as large as a hazelnut. He describes the shape as like two "whorls" base to base, perhaps an echo here of the comment in the Indian Artha śāstra that the best diamond crystals could spin like a top. Pliny's second "true" adamas was the Arabian, similar to the Indian, but smaller. The Roman province of Arabia included a whole swathe of the Near East, incorporating what are now Israel, Jordan, Lebanon, Palestine, and Syria, thus straddling the main overland trading centers for goods from the East. It is possible that Pliny's smaller diamonds represented the little Indian diamonds that formed part of the overland Arab trade rather than large ones that reached the Roman world as a result of the then blossoming direct sea trade with India. Another possibility is that Pliny's smaller diamonds were the little chips and splinters of diamond for lapidary purposes that for centuries had been brought from India by Arab traders. The other four types of adamas that Pliny describes were of silvery color and found with gold—an occurrence noted earlier by Plato. Pliny tells us that ancient authorities thought the only examples of adamas were the small, pale, seed- like grains found in the Ethiopian gold mines and called the "knot of gold." However, by Pliny's time there was also cenchros, Greek for millet seed, which it resembled in size; the Macedonian adamas, of cucumber- seed size, found in the gold mines of Philippi; and a more coppery- colored adamas from Cyprus. Pliny also tacks on siderites, which shone like iron and was heavier than the other varieties, but concludes that neither the Cyprian adamas nor siderites were really worthy of the name adamas. The gold-mine adamas sound very much like the silvery platinum metal grains noted above as frequent associates of gold (Ogden 1977).¹ Pliny's statements that adamas was so tough that it could not be hammered without risk of the hammer splitting, and that it conquered fire, have drawn considerable derision in more recent years. Both statements are untrue of diamond. However, a careful reading of Pliny's original text suggests that he was attributing these properties to the gold- mine adamas only. The silvery platinum- group metal grains so commonly found with gold and ubiquitous as inclusions in

ancient gold objects (see figure 2.2) are typically mixtures of iridium, osmium, and often ruthenium (Ogden 1977). Such grains are among the hardest natural mineral products in the world and still almost impossible to flatten mechanically. Their melting temperatures can be more than double those attained in iron production furnaces. Pliny's seemingly preposterous statement that "if a magnet is moved towards the iron and seizes it, the adamas snatches the iron and takes it away" bears a remarkable resemblance to metallurgist Ernest Smith's statement two millennia later that some platinum metal grains from the Urals in Russia "attract iron filings more powerfully than an ordinary magnet" (Ogden 1977; Smith 1947, 458). The description of the platinum metal grains in gold as adamas continued into medieval times: in his *Best Thoughts on the Best of Stones*, the Arab poet and author Ahmad al-Tifashi (died 1253) noted that those working gold were aware of the specks of almas (the Arabic equivalent of the Greek adamas) that could be embedded in it and spoil it (Abul Huda 1998, 119). For some fifteen hundred years, Pliny seems to have been misunderstood, and diamonds continued to be described as resistant to hammering and fire, and magnetic. The 1491 *Hortus Sanitatis* illustration in figure 1.10 shows diamonds resisting the heat of a roaring fire.

Roman Diamond- Set Jewelry Pliny lived at a time of expanding trade connections with the East. The traditional trade routes had been overland, the same trails that Alexander and his armies had trodden, or via various intermediaries in the coastal trade round Arabia and the Persian Gulf. The discovery of the navigational benefits of the monsoons in the second century BC allowed direct trade from the Red Sea to India, further facilitated when, in 26 BC, the Romans subdued the Yemeni trade competition. Soon, according to the Greek geographer Strabo, 120 ships set out from Egypt on the trip to India each year, sailing with the monsoon (Strabo, *Geography* 2.5.12). A century later, an anonymous Greek-speaking merchant in luxury goods living at the trading port of Berenike Troglodytica on the Red Sea coast wrote a handbook on the sea trade from the Red Sea down the east African coast and across the Indian Ocean. Among the trade goods that he says could be obtained from southwest Indian ports were "all kinds of precious stones," including adamas, which came from the ports of Muziris and Nelkynda, both probably in Kerala, southern India (Casson 1989, 84–85, 223). The arrival of diamonds fit for jewelry in the Roman world was probably a direct result of this large-scale, two-way luxury trade with India instigated in Roman times.

Nevertheless, there appears to be no confirmed, surviving diamond-set jewelry found in the Mediterranean world from Pliny's time. There have been some proposed early Roman diamonds. The British Museum possesses a Roman bronze statuette in an archaizing Greek style dating to between the first century BC and the first century AD, obtained from the jeweler Castellani in Rome in 1873. This has eyes set with small diamonds, which have often been cited as an early Roman use of the gem. A study in 1953 showed that the little stones were indeed diamonds, but were of rose-like cut and bore a resemblance to those used sometimes in watch bearings in the eighteenth and nineteenth centuries. The eye sockets also revealed signs of modern interference, and the conclusion was that the diamonds were a relatively recent embellishment to the piece (Grodzinski 1953a). Another possible use of diamond eyes needs corroboration. The eruption of Vesuvius in AD 79 that killed the inquisitive Pliny also killed a female slave whose recently found body was wearing a massive gold snake bracelet or armlet inscribed to show it had been given to her by her master. Press reports have said that the eye inlays are small diamonds, although to my knowledge this has not been confirmed gemologically (Johnston 2000). If these are indeed diamonds, this bracelet would be the earliest known piece of diamond-set Roman jewelry. The New Testament book of Revelation, generally accepted as being written in the final quarter of the first century AD, refers to

the walls of Jerusalem as garnished with “all manner of precious stones” (Revelation 21: 19–20). The twelve gems listed, similar but not identical to those in the high priest’s breastplate, do not include diamond. One might imagine that if diamonds were then widely familiar as a valuable gem, they would have been included. Nevertheless, Roman diamond-set jewelry, and mentions of it, became commoner with time. In one of his epigrams, the poet Martial commented that the Roman senator and fellow poet Lucius Arruntius Stella (flourished ca. AD 100) wore rings of sardonyxes, emeralds, diamonds, and jasper on a single finger—paid for by his poetry skills (Ker 1919, 1:303 = Martial Epigrams 5.11). A few years later a possibly fictional diamond “made precious by the finger of Berenike” was described by the Roman poet and satirist Juvenal as having been bought from a merchant near the Portico of Agrippa in Rome at the December feast of the Sigillaria (Ramsay 1928, 94–95 = Satire 6.156). This Berenike was not one of the earlier Egyptian queens so named, but the sister to, and allegedly lover of, King Herod Agrippa II. Indeed, Juvenal says that this ring “was given as a present long ago by the barbarian Agrippa to his incestuous sister.” Juvenal’s readers no doubt understood that, then as now, there was a commercial premium for a jewel provenance both royal and salacious. The Roman historian Cassius Dio recorded in his *Historia Romana* that the Roman emperor Augustus presented his adopted son, Agrippa, initially also his heir, with his ring (Cary and Foster 1917, 6:271 = Cassius Dio 53.30.2). There is no mention of this being diamond, but in AD 97 the Roman emperor Nerva continued the tradition and presented his ring to his successor, the man who would become the emperor Trajan (Magie 1921, 8–11 = *Historia Augusta* 1.3.7). This ring is said to have been a diamond, although this report is found in the *Historia Augusta*, a work compiled later in the Roman period and of debatable accuracy. A generation later, this same ring was passed on to Trajan’s adopted successor Hadrian (Magie 1921, 8–11 = *Historia Augusta* 1:3.7). It was about this time that Dionysius Periegetes—Dionysius the Traveler—wrote a description of the world and mentioned “sparkling diamonds” (ἀδάμαντα μαρμαίροντα) from Southern India (Bernhardy 1828, 307 line 7). A few generations later the Alexandrian geographer Claudius Ptolemy (ca. AD 90–168) was more specific, explaining that the diamond mines in India were controlled by the Sabarai tribe, possibly deriving this information from the description of diamonds from Sabhārāṣṭra in the Indian *Arthaśāstra*. We have no text of Ptolemy’s *Geography* earlier than medieval copies, but this possible equation of Ptolemy’s Sabarai with Sabhārāṣṭra adds credibility to the diamond mention being ancient. The little diamond-set ring in figure 2.3 was buried with a girl near Rome. She was born in about AD 150 and died while still in her teens (Bedini et al. 2012). The style of burial has been linked to the Syrian community in Rome, and it is worth noting that this was the time of the military expedition of Roman emperor Lucius Verus to Syria and the East (AD 163) that helped to stimulate the trade in Eastern products to Rome. This little diamond is in its natural octahedral crystal form, since diamond could then be neither cut nor polished. It weighs about 0.15 carats and extends through the mount and would have touched the finger. If later practice is anything to go by, this contact may have been intentional, allowing the supposed powers of the diamond to pass to the wearer.² From the far west of the Roman empire, near Granada in Spain, we have a dedicatory inscription of the later second century AD on an elaborate marble base for a statue of the goddess Isis that lists the jewelry with which she was decked, including two rings set with diamonds on her little finger. The French Benedictine monk Bernard de Montfaucon (1655–1741), who first published this statue base, noted that he had not previously encountered any mention of Roman diamond-set jewelry (Montfaucon 1722, pl. 136, 324–25). A hundred years later, in 1822, the mineralogist Delvalle Varley was seemingly the first to note a surviving Roman diamond-set ring, one by then

already in the British Museum, but her friend commented that it was not a very elegant ornament (Varley 1822, 2:226–27). Most of the surviving Roman diamond rings date from the second half of the third century and perhaps into the fourth. At least five published examples of these have stated provenances, three coming from Syria, two from Italy. There are three further diamond- set rings formerly in the Castellani Collection, without provenance, now in the British Museum. One appears to be non- ancient, but the two others are probably from Italy since a major proportion of the objects obtained by the British Museum from the Castellani Collection in 1872 were Italian finds. One of these British Museum rings is perhaps the one that the nineteenth- century Italian jeweler Augusto Castellani referred to as “A Roman ring of the Imperial epoch, in which a beautiful hexahedral diamond is set, in its natural state weighing about one carat” (Castellani 1871, 79). Castellani also refers to a diamond- set Roman ring that had belonged to Hertz, presumably the London- based German gem and art dealer Abraham (Bram) Hertz. The three “Syrian” examples are said to be from around Tartus. One of these is the gold ring set with a diamond shown in figure 2.4. This was formerly in the collection of Sir Augustus Wollaston Franks and is now in the British Museum (Marshall 1907, no. 785). The collection formed by Louis de Clercq (1836–1901), a French photographer and collector of antiquities who spent some time in Syria, included a gold ring from Tartus set with an octahedral diamond weighing about 1.65 carats (figure 2.5) previously described as a pointed topaz, and the gold ring set with a large brown diamond, previously described as an irregular topaz (see figure 1.5) (Ridder 1911, nos. 2061 and 2065; Hindman et al. 2014, 206–8). The large uncut brown diamond is in the form of interpenetrate twins and weighs about 7 carats; the ring is described as coming from Amrit, just a few miles from the city of Tartus (Ogden 1973b; Ogden 1982, pl. 29). The first of the two rings from Italy is a gold ring set with what is probably an octahedral diamond now in the Louvre in Paris, and which was formerly in the Campana Collection and said to be from Rome (Ridder 1924, no. 1164). The second is in the British Museum, formerly in the Franks collection, and is set with what appears to be an octahedral diamond and said to have been found in Sant’Angelo dei Lombardi in Campania, Italy (Marshall 1907, no. 846). This is set with what is called “a pyramidal yellow crystal.” There are various other later Roman gold rings without provenance in museum and private collections, and a few fakes. All the diamonds in Roman rings are used in their natural, uncut state. In most cases, the Roman rings are set with one, rarely two, diamonds, but a ring now in the Thorvaldsen Museum in Copenhagen is set with a diamond octahedron and a cabochon emerald (figure 2.6, also Hindman et al. 2014, 209). The only Roman gold object other than a ring set with diamonds of which I am aware is the gold seal in figure 2.7 formerly in the Castellani Collection said to have been found in Rome (Marshall 1907, no. 2954). This is a curious and I suspect composite object, not unique in the Castellani Collection. The black onyx with its intaglio monogram and the base of the object in which this is set are probably nineteenth century. The two gem- set components that rise from it are probably reused later Roman components, but what they derive from is unclear. One of these is set with a small but fine- quality natural diamond octahedron of about 0.2 carats, the other with a conical garnet of typical Late Roman form. There appears to have been a third vertical element originally, now missing. The “clusters” of later Roman diamond rings in Italy and Syria are not unexpected. Rome was the center of the Roman empire; a huge concentration of wealth with an endless desire for conspicuous consumption. Syria lay at the end of the trade routes from India to the Mediterranean, and indeed Aleppo in Syria continued to be a major trading center for Indian luxury goods, including diamonds, into the seventeenth century. Further west, in Europe, Roman- period diamonds are elusive,

although the two diamond rings described on the statue of Isis in Spain, mentioned above, show that they were not unknown there. A ring found near the major Roman city of Trier, in Germany, was illustrated and listed by the German archaeologist Friedrich Henkel in his comprehensive catalogue of Roman rings from the Rhineland (Henkel 1913, no. 1812, 36 • The Ancient World 1:164; 2: pl. 67). Henkel describes the gem as “water white,” but notes: “Whether this is a rock crystal or a diamond, cannot be determined without detailed investigation.” The best that can be gleaned from his small photo is that the ring is in the Late Roman style of the diamond-set rings from Syria, and the little stone appears to be of a pyramid shape. Diamond seems likely. The present whereabouts of this ring are unknown. There are fewer surviving Roman gold rings set with colorless rock crystal than with diamonds, and even some of those are cut into octahedra, presumably as deliberate imitations of diamond, as in the Late Roman gold ring set with what is now a rather worn octahedra of rock crystal in figure 2.8 (Ogden 1973a).

Diamonds in the Early Byzantine World In AD 324 the emperor Constantine founded Constantinople as his new eastern capital, heralding what is referred to as the Early Byzantine period. To my knowledge, there are no surviving diamonds from this time and no documentary references to specific examples. Most of our information comes from the musings of the early Christian writers. They tend to repeat Pliny, cite Jeremiah’s diamond-tipped stylus, and link the exceptional hardness of diamond with such Christian virtues as the strength of the human soul. Perhaps the most objective mention of diamond is by Augustine of Hippo, later St. Augustine (AD 354–430), who notes: “The diamond is a stone possessed by many among ourselves, especially by jewelers and lapidaries, and the stone is so hard that it can be wrought neither by iron nor fire, nor, they say, by anything at all except goat’s blood. But do you suppose it is as much admired by those who own it and are familiar with its properties as by those to whom it is shown for the first time? Persons who have not seen it perhaps do not believe what is said of it, or if they do, they wonder as Figure 2.4. (opposite top) Roman gold ring from Tartus, Syria, set with an octahedral diamond, third century AD. Credit: The British Museum, 917,0501.785. © The Trustees of the British Museum. All rights reserved. Figure 2.5. (opposite middle) Roman gold ring from Tartus, Syria, set with an octahedral diamond, third century AD. Credit: Formerly in the de Clercq Collection, Paris. Courtesy of Benjamin Zucker. Figure 2.6. (opposite bottom) A Late Roman gold ring set with a diamond crystal and cabochon emerald, third century AD. Credit: Thorvaldsens Museum, Copenhagen, H1804.

The Ancient World • 37 at a thing beyond their experience; and if they happen to see it, still they marvel because they are unused to it, but gradually familiar experience dulls their admiration” (Augustine, *The City of God* 21.4). The allegorical potential for diamonds was not limited to early Christianity. In India, the so-called Diamond Sutra, a Buddhist text dating back at least as far as the first few centuries AD, tells us little about diamonds other than that the teachings of Buddha “will cut like a diamond blade through worldly illusion.” The Roman poet Virgil in the first century BC had described a “mighty gate” that was “columned in diamond [adamas]. Figure 2.7. A gold seal. The upper part is seemingly made from two Roman jewelry components, one set with a diamond crystal, the other a garnet. The lower section is most likely modern. Formerly in the collection of the jeweler Augusto Castellani and probably assembled by him. Credit: The British Museum, 1872,0604.871. © The Trustees of the British Museum. All rights reserved. Photo: Jack Ogden. 38 • The Ancient World

No human power, nor even the gods, can prevail against this gate” (*Aeneid* 6.552). Maurus Servius Honoratus at the end of the fourth century AD felt it necessary to explain to readers of Virgil that diamond was a hard and solid stone that resisted iron and could only be broken using goat’s blood.

In contrast, his contemporary Augustine of Hippo seems to have expected his readers to possess such knowledge of the natural world because it was needed in order to understand the allusions in the Bible: “in regard to minerals and plants: knowledge of the garnet, for instance, which shines in the dark, throws light upon many of the dark places in books too, where it is used metaphorically; and ignorance of the beryl or the diamond often shuts the doors of knowledge” (St. Augustine, *On Christian Doctrine* 2.15). This passage places diamond firmly within the context of other gemstones, but may simply echo Pliny rather than indicate any significant use of diamonds in jewelry in Augustine’s day. One of Augustine’s contemporaries, St. Epiphanius, Bishop of Salamis in Cyprus, wrote a commentary on the twelve stones of the Jewish high priest’s breastplate (Blake and de Vis 1934). He makes no mention of diamond, but surely would have done so if it had been a highly esteemed gemstone in his day. A couple of centuries later, Isidore, Bishop of Seville, dismissed diamond as Figure 2.8. Late Roman diamond ring set with an octahedron of rock crystal imitating diamond. Credit: Private collection. Photo: Jack Ogden. “a small, unsightly stone from India, fragments of which were used for engraving and perforating gemstones” (Barney et al. 2006, 325–26). The lack of diamonds in Early Byzantine jewelry can be explained partly by a significant reduction in, if not cessation of, trade between the Mediterranean world and India. The overland trade and the maritime trade around Arabia were largely blocked by the expansion of the Sasanian Persian empire after the third century AD. Initially, perhaps, just the coastal and more northerly trade routes were affected, since surviving Early Byzantine jewelry clearly demonstrates that the pale blue sapphires from Sri Lanka (Ceylon) had become relatively abundant. A switch in focus from India to Sri Lanka is supported by finds of Sri Lankan sapphires at Egyptian sites on the Red Sea (Wendrich et al. 2003, 62). Even this trade faded later since it appears that the important port of Berenike on the Red Sea, the base of the writer of the *Periplus*, was gradually abandoned during the sixth century AD (Sidebotham and Wendrich 1999). Diamonds as a Lapidary Polish In the early third century AD, Gaius Julius Solinus, a geographer and linguist about whom little is known, mentions diamonds from India in his *De mirabilibus mundi* (The wonders of the world) and comments that sapphire, although hard, could be engraved with a diamond (Mommmsen 1895, 136, 193–94). By Solinus’s time, diamond chips had been used to engrave and drill other gem materials for the best part of a millennium, but ancient use of finely ground diamond powder to polish gems is less easy to demonstrate that early. Diamond can only be cut or polished with diamond, and so lapidary use of diamond powder was a necessary prerequisite for the development of diamond cutting. The diamonds set in ancient jewelry are all in their natural form with no evidence of polishing, but sapphire, second only to diamond in hardness, was being polished by the third century BC. The pink sapphire in the ring from Aï Khanoum (see figure 2.1) is an early example. However, the ability to polish sapphire does not necessarily imply the use of diamond dust as an abrasive. The eleventh-century Persian scholar al-Bīrūnī, although probably the first to specifically mention grinding diamond to powder, notes that the surface of a ruby (the same mineral species as sapphire and of equal hardness) is “made uniform and smooth with the emery,” but admits that this might take a month of polishing (Said 1989, 40). Even use of emery was not essential for a fine polish. Sapphires have traditionally been polished using tin oxide, which, although far softer than sapphire, acts by causing some sort of localized surface flow perhaps related to the Beilby layer, an amorphous layer formed on the surface of metals during polishing. This concept has been rejected by much of the scientific community, but experienced gem cutters say they make use of it on a day-to-day basis (Crowcroft 1981;

Harrington 2011). Recent research has shown that a similar surface layer may be produced in diamond polishing (Grillo and Field 1997; Pastewka et al. 2011). The sharp edges on some later Roman and Early Byzantine sapphire beads are the strongest evidence yet for diamond powder being employed, but further research is needed to substantiate this. It seems probable that the sapphires used in Roman and Early Byzantine jewelry were imported as ready-worked gems or beads, and perhaps diamond powder was employed by gem workers in India for several centuries before the practice was known further west. To date, there appears to be no certain evidence that diamond dust was being used as a lapidary polish in Europe or the Near East until medieval times. The early history of diamonds clearly reveals their origin in India and transport to the Mediterranean world with initial use as sharp chips for drilling or engraving other gem materials. The earliest use of diamonds in jewelry so far known appears to be in northern India and up into Afghanistan. This was the time following Alexander the Great's military campaigns that stretched into this area, and the resulting Hellenic influence, so it is hardly surprising that rumors of these extraordinary gems, "fit only for kings," reached the Mediterranean world. Diamonds then became an article of trade, albeit a rare one, in Roman times, the overland trade route reflected in the cluster of Roman-period diamond rings found in Syria. The trade continued into Early Byzantine times, but then the actions of the Sasanian Persians and the rise of Islam seemingly cast Europe and the Mediterranean world into some five centuries of a diamond dark age.

The Ancient World • 411 In this chapter, we will look at diamonds and their use in ancient jewelry to the lands east of the Mediterranean, in Persia and across to India itself. That the earliest surviving diamond rings, such as the one in figure 2.1, come from Afghanistan and the Indian subcontinent is not surprising since India was the main, if not the only, diamond source then known. An Indian Sanskrit manuscript called the *Arthaśāstra* (The lesson of profit) provides early evidence for diamonds being considered as gems. It has been supposed that this work was written by Kauṭilya, a minister to the emperor Chandragupta under the Mauryan dynasty in northern India 3 Early Persia and the East around 300 BC, but the dating of the text has been debated. Recent study by Patrick Olivelle, a scholar of Sanskrit literature, suggests that it was actually compiled in phases between about the later second century BC and the late third or fourth century AD (Olivelle 2013, 25–28). The section devoted to diamonds includes a note on the sources of diamond, their colors, and their ideal form: "Diamonds come from Sabhārāṣṭra, Tajjāmārāṣṭra, Kāstīrārāṣṭra, Śrīkaṭana, Maṇimanta and Indravāna" (Olivelle 2013, 123–24). Olivelle says that any attempt to identify these places is just guesswork (2013, 531). However, an association of Sabhārāṣṭra with the Indian diamond mines controlled by the Sabarai tribe seemingly noted by the Alexandrian geographer Claudius Ptolemy, as mentioned earlier, is tempting. The list of diamond colors given in the *Arthaśāstra* includes "cat's eye, Śirīṣa flower, cow's urine, cow's fat, clear crystal, Mūlāṭī flower" and then adds "any other gem color," which is little help to us, but it does say that the best diamonds were large, See figure 3.8. 43Figure 3.1. Diamond- and ruby-set ring found in a cylindrical gold box with gems and a Mauryan-period coin from the Taxila region of Pakistan, ca. third century BC. Credit: Private collection. Photo: Jack Ogden. 44 • Early Persia and the East heavy, and hard; had symmetrical points; could scratch a vessel; would spin like a top; and sparkled brightly. On the other hand, a diamond lacking points or edges, or with a defective side, was inferior. This text reveals a high level of sophistication in the appreciation of diamond and is the earliest acknowledgment we have that complete, fine crystals were more cherished than broken ones. There is also mention of mining in pits and from streams, suggesting that diamond mining was by no means an insignificant operation. At Jonnagiri in

southern India there are rock-carved edicts of the emperor Ashoka (ruled ca. 268–232 BC) that are said to refer to the diamonds and gold found there (Panjikar and Ramchandran 2005). The diamond ring in figure 2.1 is not unique among finds from the Indian periphery of the Greek world. A simpler ring in a private collection, also with a pink sapphire flanked by two diamond crystals, was found in a Buddhist reliquary in the Taxila region of what is now Pakistan in a small cylindrical gold box together with emerald and sapphire beads plus a copper alloy coin of the Mauryan period, circa the third century BC (figure 3.1). A detail of one of the flanking diamonds is shown in figure 3.2. A magnificent gold ring set with an octahedral diamond crystal, now in the al-Sabah collection in Kuwait (figure 3.3), bears an inscription in Kharoṣṭhī, a script current in Afghanistan and Pakistan between about the third century BC and the fourth century AD. This has been dated to around the first century BC and described as Indo-Parthian (Carter and Freeman 2013, 154, no. 78). A very similar ring, said to be from Pakistan, was recently seen on the London market. The gold ring in figure 3.4 is also said to have been found in Afghanistan or Pakistan and was formerly in the Jürgen and Gudrun Abeler collection, now in the Yevdayev collection (Spier and Ogden 2015, 54–55). This is set with two small, uncut octahedral diamonds on very high rounded shoulders, flanking a green chalcedony. I previously dated this to contemporary with the Roman period, but the form with two diamonds flanking a central colored gem may tie it in with rings such as those in figures 2.1 and 3.1, and perhaps an earlier date is probable.

Sasanian Between AD 224 and 651 a huge swathe of land encompassing the regions between the Arabian Gulf, the Black Sea, Afghanistan, and, for a time, as far west as the eastern shores of the Mediterranean was ruled by the Sasanian dynasty of Persia. During the reign of the second Sasanian emperor, Shapur I (AD 240–270), Sasanian influence was extended further into northern India. This is a time when we might expect to find diamonds in Sasanian jewelry, but the evidence is elusive. Shapur himself is said to have invaded Roman territory in AD 258 wearing a diamond-studded apron (Ragozin and Benjamin 1889, 206; Brose 1954). However, I have been unable to trace the original source of this story. It is also reported that the governor of Ormus on the Persian Gulf purchased expensive diamonds for Shapur I's son Hormizd I and told him that if he Figure 3.4. Gold ring set with central green chalcedony and flanked by small octahedral diamonds, from Afghanistan or Pakistan. Photo: Slava Yevdayev.

Persia and the East • 47 didn't want them, he could easily sell them for a good profit. Hormizd supposedly replied that the money was unimportant, but if he meddled in trade, who would act as king (Farr 1850, 280–81)? Unfortunately, I have not been able to find the original source of this account either. Although magnificent Sasanian silver objects are well known, surviving gold jewelry is rare. The main exceptions are rings, and these are typically set with intaglio gems that could function as seals. These gems are usually opaque stones such as orangey-red carnelian and agates, with some transparent red garnets. A simple ring set with an octahedral diamond said to have been found in Pakistan may be of the Sasanian period (Bopearachchi, Landes, et al. 2003, 327, no. 284). The form and construction is comparable with rings of the Late Roman period, although a somewhat similar ring from Southeast Asia, perhaps Vietnam, has been dated to the ninth century AD (Bari and Sautter 2001, 314). The later Arab historian and geographer al-Mas'ūdī said that the Sasanian ruler Kosrau II Parvis (AD 591–628) owned a ring set with “a seal of which the bezel was red jāqūt [ruby or pink sapphire]. Its engraving was a portrait of the king and round it was inscribed the titulature of the king. Its ring was almās.” Almās is diamond, but a hoop of diamond is highly unlikely, as Adrian Bivar, emeritus professor of Iranian studies at the School of Oriental and African Studies, London, pointed out (Bivar 1969, 33). A hoop set with diamonds is possible, or

perhaps, if the ring is not fanciful, there was a circle of small diamonds around the jāqūt. Early Islam During the seventh century, the Sasanian empire was conquered by the expanding forces of Islam, and from this period until 48 • Early Persia and the East the eleventh century, we find almost no Eastern gemstones in surviving Islamic jewelry (Spink and Ogden 2013). For information on diamonds, we now have to turn to documentary sources, including the growing class of fiction. The most familiar of the latter is the Kitāb al-f laylah wa- laylah, better known in the west as One Thousand and One Nights, a compilation of stories adapted and supplemented over the centuries, but with many of its roots in Islamic literature of the ninth and tenth centuries AD. Its stories include many allusions to diamonds and other gems. In them we can see something, even if exaggerated, of the great wealth of Baghdad, a city founded as the capital of the Abbasid Islamic caliphate in AD 762. A glimpse of this Arab trade might be seen in the Sanskrit Dashakumaracharita, probably of the sixth to eighth centuries AD, which refers to a diamond of immense value that could be obtained from a “Yavana” trader named Khanati (Chandra 1977, 235). There has been debate over the identity of the Yavana; the consensus seems to be Arab or Persian, although Alexandrian has also been suggested (Das 1980, 332; Chandra 1977, 130). Certainly by the tenth century Arab merchants were to be found from Africa well south of the equator to as far east as China. Early Jewish involvement in the trade is less easy to demonstrate. Gedalia Yogev has said that the Jewish brothers Abu Sa’d al- Tustarī and Abu Nasr al- Tustarī were “influential bankers and diamond merchants in the 11th century at Cairo,” but doesn’t provide a reference (Yogev 1975, 158). Perhaps surprisingly, there is no mention of diamonds in Shelomo Goitein and Mordechai Friedman’s list of seventy- seven commodities traded from or through India taken from the medieval Jewish Geniza records from Cairo (Goitein and Friedman 2008, 15–16). Pearls and beads are included, in one case a single shipment of 95,000 beads (Goitein and Friedman 2008, 190). The so- called Kārimī Arab merchants were the main players in the Indian Ocean and Red Sea trade in medieval Early Persia and the East • 49 times, dealing in commodities such as spices, silks, and slaves, and some had flourishing operations in India, particularly at Calicut, now known as Kozhikode, on the Kerala coast. With the rise of the Mamluks in Egypt and the expulsion of the Jews from trade, Kārimī merchants, including diamond traders, took their place (Wiet 1955). Their name may have derived from the Tamil karyam, which meant “business” (Goitein 1968, 360). One of the earliest extant Arabic texts on gems is the Kitāb khawass al- jawāhir (The book on the properties of precious gems), written by the Iraqi polymath Yaqūb ibn Ishāq al- Kindī, who died circa AD 873. This work, a major source for al- Bīrūnī and other later medieval Islamic writers, is often stated to be lost, but there is a ninth- century copy in the National Library and Archives of Egypt in Cairo. It is divided into twenty- five chapters, and, after a general introduction, describes the properties of different gemstones, including diamonds. Kindi explains that the best type of diamond displays varied colors like a rainbow—an early mention of diamond’s play of colors or “dispersion.” He also notes that he had never seen a stone larger than a pine nut (Said 1989, 80). 1 Another text, probably also originally compiled in the ninth century, is De Lapidibus of the so- called Pseudo- Aristotle, possibly of Persian or Syrian origin (Ruska 1912; Thorndike 1922). This work, like many other medieval texts, was attributed to the Greek philosopher Aristotle. Here, the description of diamond lies ninth down the list of minerals, after pearl, emerald, sapphire, garnet, carnelian, onyx, malachite, and bezoar stone. Diamond, it says, is the color of sal ammoniac—that is, white to colorless (Ruska 1912, 149–50). It can be pulverized with the help of lead, and particles can then be fixed on an iron point and used to drill other gems, such as pearl, sapphire, and emerald. A diamond chip mounted on the

end of a wire can also be used to remove a stone in the bladder by insertion up the urethra, “God willing.” 50 • Early Persia and the East This dangerous, intrusive, and extremely painful operation is mentioned by several Islamic and European writers. One of the latter was the Portuguese doctor Garcia de Orta in the sixteenth century, who explained that the procedure was used by Indians (Markham 1913, 343). In the section on diamond in *De Lapidibus*, there is no specific mention of its use for ornamental purposes, and not all the stones in this section are gemstones. Diamond is followed by emery, where it is noted that this stone is mixed with shellac (the resinous secretions from the lac insect) and used to polish other gems—perhaps an early mention of the traditional Indian emery-impregnated lac polishing wheel (Ruska 1912, 150–51). There is no mention of diamond powder as a lapidary polish. *De Lapidibus* also explains that diamonds were found in a snake-filled valley in the far eastern reaches of Khorasan, where only Alexander had ventured. In keeping with the pretense that the writer was Aristotle, the writer rather enchantingly refers to Alexander as “my pupil.” In order to retrieve the diamonds without having to encounter the snakes, the locals threw meat into the valley. Birds would pick up the meat, with diamonds adhering, and the gems would be retrieved by a visit to the birds’ nests. Diamond shouldn’t be put in the mouth; for one, it would damage the teeth, and second, it might retain traces of snake venom that could kill. The Valley of Gems had already been part of folklore for several centuries, but the snakes do not seem to have been a part of these stories until the time of *De Lapidibus* and thereafter became staple accompaniments, as we see in a representation in a Turkish manuscript of circa 1582 (figure 3.5). *De Lapidibus* also made Alexander the Great (in Arabic, Iskander) the hero, although the Valley of Gems does not seem to have become part of the popular “Romance of Alexander” stories until the twelfth century (Laufer 1915, 10–11).

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Figure 3.5. The Valley of Gems showing the snakes, birds, and gems, by Vali Jan for ‘Āyisha Sulṭān (d. 1604), the daughter of Sultan Murād III. Turkish, ca. 1582. Credit: The Pierpont Morgan Library, New York, MS M.788, fol. 83v. Purchased from Demotte and Company, 1935.

A century or so after the *De Lapidibus* account, the Persian scholar and traveler Abū al-Rayḥān Muḥammad ibn Aḥmad al-Bīrūnī (973–1048) retold the story in greater detail: “Another story is that of diamonds in a cave, which is not accessible to men. Therefore, they throw fresh meat into it; the meat sticks to the diamonds. The many vultures and hawks who are attracted to the cave on account of the meat thrown into it bring out the piece of flesh from the cave. It is the habit of birds to shake off the bits of earth and other impurities from their food before eating it. People then gather up the diamonds.” There is also the familiar version in the *One Thousand and One Nights* or *The Arabian Nights*. A diamond valley, “full of perils and terrors” but not specifically serpents, is part of the “Second Voyage of Sinbad.” Here, once the birds have picked up the meat with the adhering diamonds, “the merchants come and shout at them and scare them away from the meat. Then they come, and taking the diamonds which they find sticking to it, go their ways with them and leave the meat to the birds and beasts, nor can any come at the diamonds but by this device” (Burton 1885–88, 6:19). The Venetian merchant and traveler Marco Polo similarly located the diamonds in a deep valley, impossible to retrieve because of the presence of serpents. In contrast to the ninth-century *De Lapidibus*, al-Bīrūnī in the eleventh century specifically treated diamond as a gem material, perhaps reflecting a wider recognition of its use in jewelry by his time. For him, the position of diamond among other gems was like that of a king among his subjects. He talks about diamond values, noting that a diamond in one piece was worth much more than the same weight in fragments. Al-Bīrūnī mentions one large “diamond jewel” sent by ‘Mu’izz al-Dawlah, the first of the Buwayhid emirs of Iraq in

the late tenth century, to his brother, Rukn al- Dawlah. This jewel weighed three mithqals, a little over sixty carats, a hitherto unheard- of size (Said 1989, *Early Persia and the East* • 5380). He also notes a ring with a diamond the size of a grape that had supposedly been owned by the central Asian Samanid ruler Nuh bin Mansur Samani in the later tenth century (Said 1989, 56). Generally, however, diamonds seem to have found more use in jewelry in India than further west. Early India Al- Bīrūnī notes, “The people of Iraq and Khurasan do not distinguish between the different kinds of diamonds or their colors. All diamonds are alike in their eyes, as they use them for drilling and for creating poison. They do not venerate the diamond like the Indians do.” In India, different colors of diamond were linked to different castes and considered suitable for different types of ornament: “If it appears white, it is of the finer kind. It is then used for the adornment of swords, necklaces and all other jewelry that is used to adorn the upper part of the body. If it appears red, it should be suitable for the jewelry worn in the middle of the body. If exhibiting yellow color, it is suitable for use in bracelets, rings, armlets, etc. The black kind is suitable for ornaments of the feet” (Said 1989, 76). The rarity of surviving diamond- set jewelry from pre- Mughal India is surprising since early Indian texts make it evident that diamond- set ornaments were not uncommon. For example, a diamond- set anklet plays a leading role in the Tamil classic *Shilappadikaram*, believed to have been composed in the early centuries AD. It is described as being of pure and beautifully worked gold set with rubies and diamonds (Krishnamoorthy 2011). The reality of the established gem and jewelry market described in the *Shilappadikaram* is indicated by the taxation and commercial information given in the *Arthaśāstra*, and the precise information relating to the qualities and defects of diamonds found in Indian gemological texts such as the *Agastī* • *Early Persia and the East* mata and *Ratnaparīksā*. The latter text describes diamond and its qualities and tells us that kings should associate with excellent people, “just as the diamond is set together with the most costly gems.” The section of a gold earring, probably from central India, in figure 3.6, may give an idea of the type of jewelry described in the early texts. Here there are both octahedral diamonds and rock crystal imitations. This is now in the al- Sabah Collection in Kuwait and has been dated to around the first century BC to the second century AD (Keene 2004, fig. 9). When presented at court, the eight- year- old nephew of the wife of Prabhakaravardhana, an early seventh- century ruler of a northern Indian state, wore a diamond in an armlet (Cowell and Thomas 1897, 117). The same text mentions “black diamonds glistening on bright Figure 3.6. Section of a gold earring set with octahedral diamond crystals, India, first century BC– second century AD. Credit: The al- Sabah Collection, LNS 242 J. Copyright ©, The al- Sabah Collection, Dar al- Athar al- Islamiyyah, Kuwait. *Early Persia and the East* • 55 forms” among other jewelry worn by chieftains in a lavish parade (Cowell and Thomas 1897, 202). By medieval times in India, diamonds seem to have been abundant in the higher levels of society, but there are few survivals. A rare example is the ornament likely to be of around tenth- to eleventh- century date shown in figure 3.7. This is said to have been found in north India and is now in a private collection. It is set with four highly glossy natural diamond crystals set on their sides to provide flat upper surfaces. The other gems are a square cabochon emerald and two reused pink sapFigure 3.7. Diamond and pink sapphire ear decoration, probably tenth to eleventh centuries, north India. Credit: Private collection. Photo: Jack Ogden. 56

• *Early Persia and the East* phire beads. The most likely date of this is around the tenth to eleventh centuries. It is also probably an ear decoration, although gold ornaments of similar style and technique are known in medieval Java and have been described as *vervels* — that is, rings for attachment to a hawk’s or pet bird’s leg (Miksic 2011, 1162–67). The style of setting of both these

ornaments is reminiscent of that used later in Mughal Indian jewelry, what is termed kundun setting, using gold foil burnished down around the stones. The relative abundance of diamond-set gold jewelry in medieval India is demonstrated by the inscriptions on the central shrine in the Tanjavur Temple far to the south in Tamil Nadu. These record gifts of numerous diamond-set ornaments to the deities from Kundavai Pirāṭṭiyār, a daughter of Parantaka Chola II (reigned AD 957–970). One of several such objects was a gold girdle set with 667 “large and small diamonds” (Hultsch 1891, 87 and passim). The diamonds in this and the other ornaments presented by her are described as including those with “spots, crack, red dots, black dots, and marks as of burning.” We can note that the gold ornament, both all-gold and gem-set, described in the Tanjavur Temple inscriptions have their weights given inclusive of the “lac”—that is, their resin filling, another characteristic of later kundun work. Most tantalizingly, the diamonds listed in these temple inscriptions are categorized as diamond crystals, smooth diamonds, square diamonds with smooth edges, flat diamonds with smooth edges, and round diamonds. Inevitably there is some uncertainty regarding translation of the Sanskrit terms, but it is tempting to see in these descriptions evidence for some simple cutting or polishing of diamonds in India prior to European involvement in the region—a possibility to which we will return in Chapter 14. The diamond-set ring shown in figures 3.8 and 3.9, and two others very like it, but with diamonds flanking central rubies or pink sapphires, are said to be from Afghanistan or Pakistan. One bears an incised inscription on the inside of the hoop relating it to Mu‘izz Al-Din Muhammad Bin Sam (AD 1173–1206), one of the founders of Muslim rule in India. The diamonds are natural, uncut but very glossy octahedra that again have been set on their sides, giving an impression of a simple, triangular table cut, a type of sideways mounting for diamonds that became popular in Europe a century or two later. These three rings are now in private collections, two having been offered at auction Figure 3.8. (bottom right) Gold ring with three sideways-set octahedral diamonds, from Afghanistan or Pakistan. Credit: Courtesy of Benjamin Zucker. Figure 3.9. (bottom left) Detail of ring in figure 3.8. Photo: Jack Ogden. Early Persia and the East • 57 in London in 2004 (Bonhams, Islamic and Indian Art, 29 April 2004, lot 293).² None of the diamonds mentioned above show evidence of any polishing. Al-Bīrūnī’s eleventh-century remark that diamond was being intentionally ground to powder, seemingly the earliest such mention, must mean there was an end use for it, and it seems unlikely that this was solely medicinal use or for poisoning. He does not specifically refer to diamond powder for cutting gems, but he does note that nephrite jade (yashm) from Turkistan was cut using diamond. This may have just meant the engraving and carving of nephrite with diamond chips rather than polishing. A Chinese text of around AD 1300 says: “The workers in jade polish jade by persevering application of river-gravel, and carve it by means of a diamond point” (Laufer 1915, 31). However, recent research has indicated that diamond may have been used to polish nephrite jade from a very early period in China (Lu et al. 2005). Some diamonds are found in China, and these may well have found some use for abrasives, but there are also fifth-century AD Chinese records of diamond-set finger rings being worn by foreigners and sent to China from India, and in one case from Java (Laufer 1915, 50; Yule 1866, lxviii). A gold ring set with a small diamond crystal was excavated in 1970 in a tomb in Nanjing, China, dating to the fourth or fifth century AD (Tokyo 2012, cat. 103). The diamond from Java might be the earliest reference to diamonds from Borneo, which was a source of diamond for the Chinese prior to European involvement there in the early seventeenth century (Ogden 2005). Surviving early diamond-set jewelry may not be common from the Middle East and India, but mentions of it in Persian and Arab sources, and in Indian literature, suggest that it was not

as rare as the sparse finds suggest. Even as late as the thirteenth century, the Persian writer Mohammed ben Man58 • Early Persia and the Eastsur makes no mention of diamond cutting or polishing, but he did note that diamonds were so highly esteemed in India that hitherto their export had been prohibited (Hammer 1818, 347). Such an export ban might help explain why diamonds were all but unknown in the medieval European and Islamic worlds prior to the thirteenth century.

Early Persia and the East • 59T he magnificent treasures of gold and gems found in Europe dating to the centuries following the decline of the Roman empire, such as the Sutton Hoo and Staffordshire Anglo Saxon gold work in Britain, might belie the name “Dark Ages” often applied to this period. With diamonds, however, it is appropriate. For several centuries we hear little more of diamonds in Europe, other than repeated myths and misunderstandings, before trade through centers such as Aleppo and Alexandria brought these gems to Europe again. 4 Medieval Europe Trade with the East Links between the Orient and Europe didn’t die out following the end of the Roman period. Within a century of the unknown ruler being placed in his ship burial, along with spectacular regalia, at Sutton Hoo in eastern Britain, most of the Spanish peninsula was under Moslem rule. When, a few generations later, Charlemagne was crowned Holy Roman Emperor in Rome in AD 800, he received an Indian elephant from the Baghdad- based caliph Hārūn ar- Rashīd, delivered via North Africa. From about this same time, we hear of Jewish merchants journeying between Europe and China, and in the tenth century, a trader from Spain expressed his surprise at the variety of Indian spices available at the market at Mainz (Lunde and Stone 2012, passim). Even so, there are few mentions of gems in connection with this commerce, and no specific mention of Detail of figure 4.6. 61diamonds. It is still unclear what proportion of the garnets, sapphires, emeralds, and other colored gems set in European religious objects and secular regalia of the seventh to twelfth centuries are reused Roman and Early Byzantine gems rather than new imports. Even the use of diamond chips for engraving or drilling may have become less common. This is suggested by ignorance of the matter in the thirteenth century by the German friar, Catholic bishop, and ultimately saint, Albertus Magnus. He had sufficient interest in, and knowledge of, gems to write about them in his *Book of Minerals*, but admitted: “I do not understand how they [engraved gems] are made, except that it is by some artificial and not natural method. Those, however, who write about gems say that work on very hard stones is done with fragments of diamond, which are sharp and extremely hard. But I myself do not believe this is true at all. For engraving demands instruments properly adapted; and this cannot be with fragments of diamond, unless they should be softened with goat’s blood. And this would be wasteful and much too costly; for sometimes we see a gem of little worth that has been engraved” (Albertus Magnus 1967, 133). T here had been increasing numbers of European traders traveling to the eastern Mediterranean in the later first millennium AD. Many were Italians, because of the close ties between Italy and Constantinople and the eastern Christian empire. There were Venetian and Genoese trading conclaves in cities in Syria and Palestine by the late eleventh century, and by the end of the twelfth century, Venice essentially monopolized the maritime trade in the east Mediterranean. Both Venice and Genoa also had significant trade into the Black Sea, thus linking up with the more northerly extension of the Silk Route, as traveled by the Venetian Marco Polo at the end of the thirteenth century. Against the background of this expanding trade 62 • Medieval Europewe begin to encounter mentions of diamonds in Europe. These include descriptions of their appearance and protective qualities, but seemingly no mention of specific diamond- set objec ts. Marbode, the bishop of Rennes in Brittany, in his *De Gemmarum* written in the eleventh century, said that diamonds were best “set in silver,

armored in gold, and fastened to the left arm” (Albertus Magnus 1967, 2:1:1). But Marbode, and the other medieval writers who say much the same thing, are repeating sources that are ultimately Indian and cannot be taken as evidence necessarily for a fashion for wearing diamonds in this way in Europe. The Persian poet and polymath ‘Umar ibn Ibrāhīm al- Khayyām Nishāpūrī (1048–1131), better known in the West as Omar Kha yyām, echoed earlier Islamic writers’ comments when he said: “In India bits of diamonds and red ruby are used on rings and ear rings while in Europe Bahrami [pure red] ruby and Zulmani [best green] emerald are used” (Nishābūrī 2004, 145).

Diamond in Europe Pre- 1200 In Europe there are some supposed instances of diamonds from the eleventh and twelfth centuries, but nothing tangible of which I am aware. The Holy Crown of Hungary, also known as St. Steven’s Crown, probably of eleventh- or early twelfth- century date, preserved in the Hungarian Parliament building in Budapest, has been said to include diamonds on its arches (Twining 1967, 96–97). However, Patrick Kelleher, a military captain who was responsible for the crown after it had been placed with U.S. troops for safekeeping toward the end of World War II, made a detailed study of the crown and simply described it as “set with gems and pearls” (Kelleher 1951, 33). Certainly, the gems visible in the numerous available photographs do not seem to Medieval Europe • 63 include any diamonds. Diamonds are often said to have embellished the clasp of the so- called Mantle of Charlemagne, in actuality a pearl- encrusted mantle probably made for Roger II, the Norman king of Sicily in Palermo in 1133/34, and now in the Imperial Treasury at the Hofburg Palace in Vienna (inv. XIII 14). The presence of four octahedral diamonds in this clasp was noted as early as the eighteenth century when it was in the Treasury of St. Denis, a monastery near Paris, before its loss (Goguet 1758, 116). But it is not impossible that the clasp was made when the mantle was used for the coronation of Maximilian II as king of Bohemia in Prague in 1562 (Johnson 2011, 216). The jeweler and diamond historian Herbert Tillander mentions representations of diamonds in twelfth- century German drawings, but provides no references or illustrations. The Pala d’Oro altar screen in St. Mark’s Basilica, Venice, is sometimes said to include diamonds, but I haven’t spotted any and, besides, although parts of it date from the early twelfth century, many gems have been replaced over succeeding centuries. The Later Medieval Period

Albertus Magnus may not have believed that diamond chips were used to engrave other gems, as noted above, but one of his colleagues at the University of Paris in the 1230s or 1240s did. This was the English philosopher and Franciscan friar Roger Bacon, who was perhaps the first to refute the received wisdom that diamonds could only be broken with goat’s blood. He says that he knew this was untrue because he had seen diamonds being broken with his own eyes, adding that “gems cannot be carved without fragments of this stone” (Bacon and Burke 1928, 168). His comment is significant because it shows that diamonds were being broken into chips for lapidary purposes in thirteenth- century Europe and thus that some diamonds were 64 • Medieval Europe now available. Indeed, the first certain evidence for diamonds in later medieval Europe seems to be in Venice at the beginning of the thirteenth century. The Italian historian Piero Pazzi remarks that although an old translation of a Venetian will of 1208 that equates what are described as the *giaconicii* set in a ring with yellow diamonds may be fanciful, diamonds must have been known by about this period because in 1223 there was a prohibition against goldsmiths setting counterfeit diamonds (Pazzi 1986, 9–10). Further to the east, Edward Gibbon tells us that John III Doukas Vatatzes, emperor of Nicaea in what is now Turkish Anatolia from 1222 to 1254, presented the empress with a crown of diamonds and pearls (Gibbon 1828, 8:3). This was apparently paid for by the sale of “the eggs of his innumerable poultry.” Mentions of diamonds become far commoner as

the thirteenth century progressed. In the Bibliothèque Nationale in Paris there is a bestiary—essentially a medieval encyclopedia of natural history—dating from around 1250–1260. The section on diamond has an illustration of a man finding a diamond (figure 4.1) with the accompanying text telling us that “the diamond comes from the East, where it is found at night by its shining.”

Octahedral diamonds on an eastern mountain were seen in the Franco- Flemish manuscript of about 1270 in figure 1.3. A more practical text from about the same time, perhaps a decade or two later, is a dictionary probably for Italian merchants, the so- called Interpreter’s Book, part of the Codex Cumanicus now in the Biblioteca Nazionale Marciana in Venice (Golden 1992; Kuun 1880). This has word lists in Latin, Persian, and Cuman, the Turkic language then being spoken between the Ukraine and central Asia, thus tying in with the reestablishment of the Silk Route as a relatively safe commercial artery from the eastern borders of Europe to China following the emergence of the Mongol empire. The precious stones listed include diamond, with its Latin name given as *diamante*, an early instance of this modern form (Kuun 1880, 108–9). The Venetian chronicler Martino da Canale tells us that at the celebrations marking the election of Lorenzo Tiepolo as doge in Venice in 1268, the goldsmiths were arrayed in rich clothing decorated with precious stones of great value, including diamonds (Buckton 1984, 6). A quarter of a century later, Marco Polo set off east along the Silk Route and on his return provided a useful glimpse of the diamond trade. The Indian diamonds that reached Europe, he tells us, were “only the refuse”; any diamond of importance was taken to the Grand Khan—Kublai Khan in China—and other rulers (Yule and Cordier 1993, 2:361). Polo’s editor Giambattista Ramusio adds that Polo brought back diamonds to Venice sewn into his clothing. These were not obtained in India, he says, but exchanged for gold in the Khan’s court because “so great an amount in gold” would have been impossible to carry on “a journey of such extreme length and difficulty” (Yule and Cordier 1993, 1:5). Although most diamonds reaching Europe were brought to Venice or Genoa, merchants then carried them north. They were reaching England by the second half of the thirteenth century, if not earlier. We hear of a brooch set with two diamonds belonging to King Henry III of England in 1261 and others set in a gold cup that the rebellious Robert de Ferrers, Earl of Derby, had to relinquish in 1265 to obtain this same king’s pardon (Téxier 1857, 641; British Library MS ADD 15664). Also that year we have a record of the jewels pawned by the king, including a remarkable total of thirty- eight diamond rings, kept on two sticks (Public Record Office 1910, 502). The treasure of Henry’s successor, Edward I (ruled 1272 to 1307), is said also to have included a diamond- set ring (Lehmann- Brockhaus 1960, no. 6261). Nevertheless, diamonds were not always present in royal jewelry. In 1272, Henry III of England sent a considerable amount of jewelry to Paris for safekeeping. The list includes all manner of jewelry, including crowns, brooches, and rings with “diverse precious stones”; rubies, spinels, sapphires, emeralds, topazes, and peridots are named, but there is no mention of diamonds (Rymer 1727, 1:878–79). Early fourteenth- century mentions of diamond- set jewelry include two diamond- set rings supplied by the Parisian goldsmith Guillaume le Perrier in 1303 (Richard 1887, 235). A document dated 1304 says that John II of Avesnes (1247–1304), Count of Hainaut, Holland, and Zeeland, had a small diamond ring, and the inventory of Count Robert de Bethune—“the Lion of Flanders”—made following his death in 1322 included “a beautiful diamond” he had received from his father (Dehaisnes 1886, 401, 440). Diamonds could also be possessed now by the rising class of rich merchants and tradesmen. For example, at the time of his death in 1317, Richard de Blountesham, seemingly a wealthy London taverner, owned two diamonds, although their value was noted at just six shillings and eight pence

Medieval Europe • 67 (there were twenty shillings to

a pound and twelve pennies to a shilling) (Riley 1868, 124). Also, there was a useful test for a wife's faithfulness: "if any man put a Diamond under the head of a woman sleeping, she manifesteth if she be an adulterer, for if she be so, she leapeth back out of bed afraid, and if not, she embraceth her husband with great love" (Best and Brightman 1973, 93–94). Such a test would have been cruel to report if suspicious husbands had no access to such stones. Albertus Magnus attributes this same power to the mineral magnetite, but Bartholomeus Anglicus, an early thirteenth-century scholar, cites diamond in this context, as does a manuscript of the mid-thirteenth century (Albertus Magnus 1967, 2:2; Evans and Serjeantson 1933, 30). Garcia de Orta in the mid-sixteenth century commented on this belief, but said it was "a thing I am unable to believe" (Markham 1913, 349). A century later, the English writer Thomas Nicols quotes it without any misgivings (Nicols 1652, 51). From the second half of the fourteenth century onward, diamonds became relatively abundant in Europe. In England there are several mentions of diamond rings, such as those given as diplomatic gifts by the kings Edward III and Richard II. For example, in 1392 Richard II sent a gold ring set with a diamond to the king of France with Sir Thomas Percy, who was with the embassy negotiating peace in England's Hundred Years War with France (Newport 1837, 246). Two years later he gave another diamond-set gold ring to Viscount de Meloun, who was visiting England on a similar peace mission (Newport 1837, 253). In the time of Richard II, an import duty was imposed for every pound weight of "precious stones, or any manner of jewels" brought into England (Ruding 1840, 237–38). Some records give the prices paid for diamonds. In the second half of the fourteenth century, we have two diamond rings bought for a total of £12, one for £5, and one diamond for 68 pence • Medieval Europe £20 (Newport 1837, 156, 265). A ruby and diamond ring cost Figure 4.2. Gold ring set Edward III the then-huge sum of £167, and he paid £65 for a single large diamond (Newport 1837, 176). Records of diamonds in private hands include one set in a ring involved in a legal dispute in 1367 (Thomas 1929, 75). Surviving Later Medieval Jewelry Set with Diamonds Despite the relatively abundant documentary mentions, there are few tangible examples of diamonds in Europe until the mid-fourteenth century. An early example is a gold ring from Clerkenwell in London, now in the British Museum, set with an octahedral diamond, and of thirteenth- or fourteenth-century date (figure 4.2; Oman 1974, 109 cat. C; O. M. Dalton 1912, 162 cat. 1006). This has the inscription (in French) probably to be read "I am here in place of a friend, yours with this gift" and a clasped-hands motif on the back of the hoop, showing that this was a love ring and thus probably a betrothal ring. This ring is with octahedral diamond from Clerkenwell, London, thirteenth or early fourteenth century. Credit: The British Museum, 1857,0928.1. © The Trustees of the British Museum. All rights reserved. Medieval Europe • 69 perhaps the earliest surviving diamond-set ring with love associations, and it is unfortunate that it cannot be more precisely dated. The inscription is in Lombardic script, which is typical of the thirteenth and fourteenth centuries, being superseded by Gothic "black letter" in the second half of the fourteenth (Ward et al. 1981, 54). A similar ring, with clasped hands and a Lombardic love inscription set with a sapphire, was found in Hatfield Forest, England, in 1980 and has been dated to the thirteenth century (British Museum inv. 1980,1202.1; Ward et al. Figure 4.3. (top) Holy nail reliquary in gold and enamel set with an octahedral diamond and ruby, incorporated into the gold reliquary cross in the Treasury of St. Vitus Cathedral in Prague. Photo: Andrej Šumbera. Figure 4.4. (bottom) Detail of the diamond set in the nail reliquary in figure 4.3. Photo: Andrej Šumbera. 70 • Medieval Europe 1981, 64; Alexander and Binski 1987, 484 no. 646). There is a nail reliquary, which is a holy relic supposed to contain one of the nails used to crucify Jesus, mounted in gold incorporated into the

gold reliquary cross in the Treasury of St. Vitus Cathedral in Prague. At one end is mounted a small octahedral diamond crystal, at the other a blood-red ruby (figures 4.3 and 4.4). The cross itself was made in the 1350s by order of Charles IV, emperor of the Holy Roman Empire (1316–1378), known to many as King Wenceslas. The nail reliquary attached to it is probably not much earlier, as suggested by its enameled “black letter” inscription. The cross, the nail reliquary, and the gems set in it were examined in detail by Czech conservator and photographer Andrej Šumbera in 2003 (Šumbera 2008). A fresco in the Chapel of the Virgin Mary at Karlštejn Castle, Czech Republic, shows Charles being presented with what appears to be an octahedral diamond—possibly the one set in the nail reliquary (figure 4.5). The identity of the donor of the diamond is uncertain. Possibilities include King Louis I of Hungary (reigned 1342–1382); Peter I, king of Cyprus and king of Jerusalem (reigned 1358–1369); or the Byzantine emperor John V Palaiologos (ruled 1341–1391). If the latter, the diamond may have been a diplomatic gift to help secure military aid against the Turks.¹ Another important medieval diamond-set object is the so-called Founder’s Jewel in New College, University of Oxford (figure 4.6). It is in the form of a crowned Lombardic initial M and was made in about 1350, probably in France. Among the rubies, emeralds, pearls, and enamel is a single, small, uncut diamond, set top center. This ornament is also known as the Hylle Jewel because it was a gift to the college in 1455 from the Hylle family of Winchester. In the final third of the fourteenth century, we have surviving diamonds in greater profusion. One of the most spectacular examples is the Crown of Princess Blanche, also called the Figure 4.5. Detail of a fresco in the Church of the Assumption of the Virgin Mary at Karlštejn Castle, Czech Republic, showing Charles IV receiving the gift of a diamond crystal, 1356. Credit: Profimedia.CZ a.s./ Alamy.

Medieval Europe • 71 Bohemian or Palatine Crown, now in the treasury of the Munich Residenz (figure 4.7). This splendid gem-set gold crown left England as part of the dowry of Princess Blanche, daughter of England’s Henry IV, who married Ludwig III in 1402. It was originally owned by Anne of Bohemia, who had married England’s King Richard II in 1382 and was probably made in Paris around 1370–80. Medievalist Jenny Stratford has recently discussed the crown at some length in her book on the treasures of Richard II based on the surviving treasure roll listing compiled in 1398/9, now in the National Archives (E 101/411/9; Stratford 2013, 258–62). This extraordinary scroll is more than thirty yards long when unrolled. The crown is perhaps the only surviving piece of the 1,200-odd jewels listed in the king’s inventory. The crown is set with sapphires, spinels, emeralds, and pearls, and, nestling in the center of quatrefoil clusters of pearls, there are diamonds (figure 4.8) or, in several cases, imitation diamonds. The quatrefoil pearl clusters may be similar to the three rings each of “four pearls and a great diamond placed in the middle of each” that Richard II purchased from a London goldsmith, John Palyn, for Anne of Bohemia in 1381/2 (Devon 1837, 221). The inventory refers to the crown as being set with thirty-three diamonds, of which eight were imitation. The genuine diamonds are very small octahedra, uncut but of reasonably regular shape. The imitations are pyramids of gold, probably integrally made with the settings, with applied black enamel (the apex of each blackened gold pyramid is of exposed gold; perhaps the enamel pulled back from the apex as a result of surface tension while firing). The same inventory also includes a mirror back and an image of the Virgin Mary with clusters of pearls around what are described as imitation diamonds (Stratford 2013, 288, 361). Also listed are collars that incorporate diamonds, thus challenging the oft-repeated statement that the earliest diamond necklace recorded was that belonging to King Figure 4.6. The “Founder’s Jewel” set with various gems, including a small diamond crystal, upper center, ca. 1350, bequeathed by Hylle family of

Winchester to New College, University of Oxford, in 1455. Credit: © Courtesy of the Warden and Scholars of New College, Oxford/Bridgeman Images. Medieval Europe • 73

Figure 4.7. The Crown of Princess Blanche or the “Bohemian Crown,” Paris, ca. 1370–80. Credit: Munich Residenz, Munich. Photo: Jack Ogden. 74 • Medieval Europe

Charles VII of France’s favorite mistress Agnès Sorel (1421–1450). A chalice in the inventory was later described as set with three large diamonds, and another chalice and a pax (tablet) are noted as each including a flat diamond (Stratford 2013, 79, 361, R980, and R982). The rings set with diamonds remind us of the “dimaundes of derrest pris” set in gold rings, as mentioned in the 1370s by the English poet William Langland (Kane and Donaldson 1988, 255). Several European diamond rings dating from around the late fourteenth to early fifteenth centuries have survived that have a high bezel set with an octahedral diamond crystal, such as that shown in figure 4.9, now in the Victoria and Albert Museum, London. Recently, two similar rings have been found in England, one at Manley, Cheshire, in 2002 (figure 4.10) and another at Fleckney, Leicestershire, in 2008. Both rings were found by metal detectorists and subsequently passed into the market. The ring in figure 4.10 is inscribed “sans fin loiauté”—loyalty without end. It also bears three letters E of uncertain significance; a connection with King Edward III (reigned 1327–1377) was proposed by the finder, but seems speculative. A similar-style ring is in the Museum Mayer van den Bergh in Antwerp (inv. 428i) (Kockelbergh et al. 1992, 46). In 1819 a gold ring set with a small cabochon ruby and five diamond crystals was found in the ruins of the Eltham Palace that Joan Evans dated to Figure 4.8. Detail of a pearl and diamond cluster on the crown in figure 4.7. Photo: Jack Ogden. Medieval Europe • 75

Figure 4.9. Gold ring set with octahedral diamond, European, ca. 1400. Credit: Victoria and Albert Museum, London, M.188- 1975. 76 • Medieval Europe

the later fourteenth century (King and Clayton 1834, 7; Evans 1921, 63). It was inscribed “Qui me portera exploitera et a grat joye revendra,” which was translated as “Who wears me shall perform exploits and with great joy shall return,” and was thus presumably for a man.² Other European diamond-set jewelry of the fourteenth century includes a diamond-set ring purchased for 11 1/2 florins in Florence in 1354/5 and the diamond rings that we are told Philip the Bold distributed to Charles VI and other nobility in Dijon in 1390 (Stuard 2006, 134; Vaughan 2002, 196). The inventories of Philip the Bold, Duke of Burgundy from 1363 to 1404, include numerous diamond-set jewels (Prost 1902–4). We don’t know how big the three “large” diamonds in Richard III’s treasure were, but probably far smaller than the diamond reportedly the size of a walnut that was listed as part of the dowry of Valentine Visconti, daughter of the Duke of Milan, when she married Louis, Duke of Orléans, in 1398. This diamond, then known as “Balle de Flandres,” passed to Charles the Bold and then seemingly disappeared when Charles was defeated at the Battle of Grandson in 1476. This may well have been the diamond that eventually resurfaced recut as “the Sancy” (Balfour 2009, 244). If so, with the Sancy weighing some fifty-four carats cut, the Balle de Flandres must surely have been some seventy-plus carats to start with. Not all the diamonds reaching Europe in the later medieval period came via the northerly Silk Route. They could have been obtained by European merchants in Alexandria and other Mediterranean trading centers at the interface between the European and Islamic worlds. The more southerly land routes to the Mediterranean and the coastal sea trade from the Red Sea or Ormus to India were thriving, with Arabs playing a significant role until they were largely displaced by Europeans in the sixteenth and seventeenth centuries. In the sixteenth century, Garcia de Orta mentioned Arabs in India sending diamonds to “Arabia” (Markham 1913, 343). In his *Best Thoughts on the Best of Stones*, the Arab poet and author Ahmad al-Tifashi (died 1253) says that Baghdad was a major center for the

diamond trade and repeats what he was told about diamonds by “some Persian gem dealers who often visit India.” Tifashi, who was born in Algeria, also mentioned jewelers from North Africa who were acquainted with diamond (Abul Huda 1998, 119). Tifashi made much the same comment as Marco Polo, that the most brilliant diamonds were “worn by Indian dignitaries for adornment purposes; they keep it jealously for themselves,” and the rest were either used for cutting corundum or “given to the merchants.” As we have seen, the commerce between Europe and the Islamic world was growing as the first millennium came to a close, with the Italians playing a major role. It is only after about 1200, however, that we begin to find clear documentary evidence for diamonds in medieval European jewelry, with a gradual increase in mentions over the following decades and surviving examples from the later 1300s. Figure 4.10. Diamond- set gold ring found at Manley, Cheshire, England, in 2002, late fourteenth century. Courtesy of Christie’s, London.

Medieval Europe • 771 It is one of history’s amusing coincidences that in Europe the negative prefix a- disappeared from the old term *adamas* —“unconquerable”—at about the same time that diamond became conquerable, with the development of polishing and cutting, the most fundamental development in the history of diamond. This chapter will consider the dawn of diamond polishing and cutting in Europe, where it is likely to have been understood by 1300 AD, although evidence is sparse. Subsequent chapters will look at the possibility of early cutting in India and the development of the more advanced diamond- working technology familiar to us today.

5 The Dawn of Diamond Cutting in Europe Cutting and Polishing Since the sixteenth century, diamond cutting has been seen as consisting of three main stages. In the optional first stage, the diamond is cleaved (split) or sawn to provide the starting form for abrasive shaping and polishing. The stone is then rubbed against another diamond to laboriously grind it closer to its intended final form, including creating the main facets (flat faces). This stage is described as “bruting.” Then, in the third stage, the diamond is held against a rotating iron wheel or “scaife” fed with diamond dust and oil to complete production of the facets and give the overall polish. A byproduct of the bruting stage is diamond powder, which is used in the final polishing. Earlier approaches to diamond cutting were less sophisticated. Initially, there was the polishing of the faces of crystals See figure 5.7. 79 and cleavage fragments. Bruting may have played no part here, and the rotating scaife was still unknown. In what follows, I use the term cutting in a general sense to cover any or all of the stages in diamond working; the term polishing refers specifically to the final polish of a face or facet. An acquaintance with the use of diamond powder for gem polishing must have reached Europe by no later than around 1200, about the same time as diamonds themselves began to appear again. The original ninth- century Arabic text of the Pseudo- Aristotle *De Lapidibus* doesn’t mention the use of diamond powder to polish other gems, but a fourteenth- century Latin edition of the same text does—the words it uses are *poliuntur et planantur* (polish and smooth). A section of the so- called Aberdeen Bestiary (f. 101r), a Latin manuscript written about AD 1300, also says that “with sharp pieces of diamond other stones are engraved and polished [*poliuntur*].” One manifestation of this renaissance in gem use and cutting was a move to colored gems cut with flat faces, away from the smooth, convex shapes typical of earlier times. An example is the faceted sapphire in the upper center of figure 4.8. We see this change in surviving European jewelry, while further east in Cairo, fourteenth- century dowry documents from the Jewish community begin to regularly include cut precious gems (Goitein 2000, 4:205). Thus, it is not surprising that by the fourteenth century in Europe, perhaps the late thirteenth, the faces of some octahedral diamond crystals were being improved. The Earliest Cutting Diamond polishing before the fourteenth century has not been

substantiated in Europe. The gold cap of Pietro Tradonico, doge of Venice between 836 and 864, has been described as set 80 • The Dawn of Diamond Cutting with a “diamond with eight facets” (Quick and Leiper 1959, 53). However, natural octahedral diamond crystals have eight faces and, besides, this jeweled headdress has been described as “probably apocryphal” (Singleton 1905, 256). The mid- thirteenth- century *Lapidario* compiled from Islamic sources for the scientifically inclined King Alfonso X of Castile has been said to provide a brief account of diamond cutting and polishing (Barrington 1906, 34). However, although this text mentions diamond splinters for drilling and engraving gems, and the production of diamond powder, the latter seems only to have been in the context of a painfully intrusive method of removing kidney stones and for use as a poison, the former perhaps more likely to kill you than the latter. There seems to be no mention of the cutting or polishing of diamond itself (*Lapidario* 2004). Indeed, the various medieval Islamic writers had been consistent in stating that diamond could not be cut, starting with the Iraqi Yaqūb ibn Ishāq al- Kindī in the ninth century, who in his metaphysical musings used diamond as an example of indivisibility (Ivry 1974, 107). Herbert Tillander remarked that cut diamonds “can be seen in German engravings of royal crowns from the beginning of the twelfth century” (Tillander 1995, 66). He doesn’t provide supporting references, however, and he also proposed that polishing of diamond crystal faces began in the thirteenth century, which would surely rule out cutting in the twelfth. Tillander also says that the French term *naïf* for natural diamond crystals had been used “at least since the middle of the twelfth century,” thereby implying that non- *naïf* —that is, cut diamonds—were also known (Tillander 1995, 22). Although the word *naïf* is recorded as early as the mid- twelfth century in reference to rocks, I have been unable to find examples of the term in the specific context of diamonds before the early fifteenth century. The Dawn of Diamond Cutting • 81

As the fourteenth century progressed, descriptions of cut diamonds began to appear in inventories, and some diamond workers were named, such as a German diamond cutter named Jehan Boule (Jean Boule) who was documented in Paris in 1381 (Fagniez 1877, 305–6). Other fourteenth- century cutters are more elusive. According to the German historian Christof Gottlieb von Murr, diamond workers were recorded in Nuremberg in the 1370s, a statement accepted by jeweler and author Edwin Streeter and a misquoting of which perhaps lay behind Feldhaus’s statement that there were diamond cutters there in 1237 (Murr 1778, 695; Streeter 1877, 23; Feldhaus 1952). However, the gemologist and historian Godehard Lenzen examined the sources and found no definitive evidence for fourteenth- century cutting in Nuremberg (Lenzen 1970, 68). Venice is often cited as the cradle of European diamond cutting, but although books and websites frequently mention records of diamond cutters in Venice in the 1330s, I have not been able to find a primary reference for this. Neither did Lenzen (1970, 73–74). The Italian historian Piero Pazzi in his book on the history of the diamond trade in Venice similarly made no mention of such early cutting there (Pazzi 1986). Most recently, Salvatore Ciriaco, professor in the Department of Historical Sciences at the University of Padua, said, “It has been proven that ‘point cut’ diamonds are to be found in Venice as early as the thirteenth century,” but he, too, cited no reference (Ciriaco 2014, 69). In 1864 Charles King mentioned Milanese jewelers, including the fourteenth- century goldsmith Anguillotto Bracciaforte, saying, “These lapidaries . . . even polished diamonds,” but gave no further reference or substantiation (King 1864, 326–27). In any case, some form of basic diamond cutting was probably practiced in Europe by the early fourteenth century, perhaps the late thirteenth, and if so, an Italian center such as 82 • The Dawn of Diamond Cutting Venice with its links with Eastern trade would be a likely place for this to have occurred. As we will see, simple faceting of diamonds was

certainly being carried out by the 1360s. Once we get into the 1400s, there is far more information. An early specific mention of cut diamonds is a document written by a Jewish gem merchant in Venice in 1403 (Sirat 1968) that provides separate prices for cut and uncut diamonds. In 1434 the Flemish copyist and bookseller Guillebert Mets provided a description of Paris for Philip the Good, Duke of Burgundy from 1419 to 1467. The original manuscript survives in Brussels, in the Bibliothèque Royale Albert 1er (MS. 9559–64). Mets mentioned the district “La Courarie” (rue de la Couvroirie), where workers in diamonds and other stones lived (Le Roux de Lincy 1855, 72–73). He also referred to “several skilled workmen, such as Herman, who polished diamonds of various forms” (Le Roux de Lincy 1855, 84; Laborde 1872, 251). The name Herman suggests a Flemish origin (Lenzen 1970, 73). Mets openly acknowledged that he copied and extracted from the works of other chroniclers, so his comments on the Parisian diamond cutters might have been drawn from another source (Le Roux de Lincy 1855, 3). Medievalist and jewelry historian Ronald Lightbown equated Herman with the known Parisian goldsmith Herman Ruissel (a.k.a. Rinssel, Rince, Ruisseau), who had been active in Paris from the mid- 1380s (Lightbown 1992, 16). Several diamond cutters are also recorded in Lyon, France, from the 1460s onward and at least one in Geneva (Audin and Vial 1918, 158; Audin and Vial 1919, 89, 247; Brun 1905, 334). The term used in the Geneva document is *diamantarius*. Further north, in Antwerp and Bruges, several diamond cutters are known by name, including Wouter Pauwels, who was described in the cathedral archives there in 1483 as a *diamantslyper* (Lenzen 1970, 73, Kockelbergh et al. 1992, 29).

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Lenzen considers this choice of term significant since *diamantslyper* literally meant “diamond polisher,” not “diamond cutter,” and thus referred to just polishing, not proper cutting (Lenzen 1970, 73). However, the drawing of a fully developed diamond cutting mill by Jan Luyken in 1694 (see figure 6.8) is still titled *Diamantslijper*. In fourteenth-century Europe, colored gems were still being polished as described by Theophilus Presbyter, probably a Benedictine monk, in Germany in the early twelfth century (Hawthorne and Smith 1979, 189–91). Theophilus makes no mention of diamond, but explains how gems, such as members of the quartz family, beryl, and emerald, were polished by rubbing first on a “flat, smooth lead plate” using finely ground abrasive and water or saliva, then on leather with finer abrasive. For sapphire, emery was used as abrasive and the “washings” were collected; the emery powder was allowed to settle overnight and then dried and reused. The process may have looked like that in an illustration in *Hortus Sanitatis* first published in Mainz in 1491 (figure 5.1). Indeed, this drawing is often reproduced as an illustration of medieval gem polishing. However, it appears in the *Hortus Sanitatis* accompanying the section on cinnabar (mercury sulfide) and may have been intended as an illustration of its grinding for use as a pigment. The fourteenth-century writer Jean d’Outremeuse of Liège also described how gems were polished on flat tables of various materials, including lead, using powdered emery and other abrasives (Cannella 2006, 270 and 282). The use of a piece of flat marble for polishing gems might be implied in a short and rather obscure poem by the physician Arnaldus de Villa Nova (ca. 1240–1311) (Wecker and Read 1660, 240): If you would have a Jewel for to shine, Seek for a polish’d piece of Marble fine, 84 •

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Figure 5.1. An illustration from the 1499 Strasburg edition of the *Hortus Sanitatis* (Garden of health) showing a man grinding a stone or mineral on a flat surface. Under the Stone, the Jewel must be got; With little water—file you hurt it not; The harder t’is, the more t’wil shine, I wot. In the early seventeenth century, William Heth, “a clerk of his majesty’s store for the navy at Portsmouth,” in his *Goulden Arte or the Jewell House of Gems* advised jewelers that they could get, keep, and

maintain the finest polish on diamonds and other gems by polishing them on a smooth, flat, and even lead table (Heth 1603, 66r). It seems likely that Heth meant a stationary rather than a rotating table. The Dawn of Diamond Cutting • 85

Early Cutting Technology There is no sure evidence for the use of a horizontal rotating polishing table for gems in medieval Europe prior to the fifteenth century, although a small wheel mounted on a rotating axis had been used for gem engraving in classical times and was also well known further east (Boardman 1970, 381: fig. 316, 448). The traditional Indian lapidary wheel consisted of resin mixed with abrasive. The wheel was rotated on a horizontal axis by means of a “bow,” a piece of wood with a length of cord attached end to end and wrapped once around the axle. By moving the bow back and forth, the wheel rotated. This type of gem- cutting lapidary wheel, like almost all early rotating craft devices across the ancient world, including lathes, and regardless of whether they were vertically or horizontally mounted, had a reciprocal, back- and- forth motion. The resulting jerking, rotary rhythm would not have been conducive to accurate faceting. Besides, precious diamond dust couldn’t be profligately embedded in a resin wheel; it would have had to be employed in modest amounts on a flat metal wheel where weight would have generated rotary momentum incompatible with bow- powered, to- and- fro motion. Indeed, early in the fourteenth century, the Indian mint- master and mathematician Thakkura Pheru had observed that diamonds could not be ground on a lapidary wheel (Sarma 1984, 52). Herbert Tillander assumed that the earliest stage in diamond cutting was a simple superficial smoothing of the natural octahedral crystals of diamond. For example, he says that most of the little diamonds in the “Bohemian” crown of circa 1370–80 (see figure 4.7) “were rubbed with some sort of polishing agent” (Tillander 1995, 24). Tillander says “some sort of polishing agent”; if he is implying anything other than diamond—emery, say—this might have served to clean off surface accretions, but it is optimistic to expect it to have any significant effect on the surface of the diamond itself. The earliest improvement to diamond was almost certainly carried out by rubbing it on a lead or other flat surface with diamond powder as abrasive, as described above, a suggestion also made by diamond specialist Paul Grodzinski (1953b, 1). The mid- fourteenth- century travelogue attributed to a probably fictitious “Sir John Mandeville” notes that diamonds were so hard that nobody could polish them. However, his comment that there were other crystals like diamonds, but not so hard, and that “commonly their points were broken off and they will lightly polish them” might hold an echo of the early polishing of diamonds (Letts 1953, 116). It was so entrenched in the medieval mind that diamonds could not be cut or polished that stones that had been so treated could surely not be true diamonds. The octahedral faces on the diamond set in the ring in figure 4.9 of about the same date as the Bohemian gold crown seem to have sparse, parallel lines that may indicate some slight attempt at improvement with diamond dust. An octahedral diamond crystal abraded and polished to create a neat, regular double pyramid shape is termed a “point cut.” Unfortunately, some writers have confused things by also describing natural octahedra as “point cuts.” It is not always possible to distinguish point cuts from the most regular and shiny natural octahedra, especially from photos. However, diamond hardness varies slightly with crystal direction, and it is extremely difficult to polish a crystal face on a diamond without doing so at a slight angle, which thus results in an octahedral point cut with apex angles different from those of a natural crystal. A surviving fifteenth- century ring is perfect witness to the early days of diamond cutting. The little diamond set in it is an octahedron, but of the four visible surfaces, two retain their original and rather irregular crystal form, and the other two faces have been polished.

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Figure 5.2. Detail of the diamond octahedron in a fifteenth- century gold r

ing. Two of the exposed faces are left in their crystal state; the two others, facing the camera, have been polished. The angle of the face on the right changes halfway up. Credit: Benjamin Zucker. Photo: Jack Ogden. 88 • The Dawn of Diamond Cutting (figure 5.2). That on the right in the photo shows a change in angle of polish halfway up. Presumably the two natural faces were considered sufficiently flat, but the other two must have been more disfigured originally and warranted attention. The quality of polish is very good. The ring in figure 5.3 is set with a remarkably evenly shaped, shiny octahedron and is likely to be an early surviving example of a point cut. The ring dates to the later fourteenth or early fifteenth century and is probably Italian. Here the inscription, in Latin, says, “Jesus passing through the midst of them went his way,” which comes from Luke 4:30 and was a protection against dangers, but also had political significance and is seen as a legend on some medieval English gold coins. Another example of such a diamond is in the ring in figure 5.4, which is of the fifteenth century. Said to have been found in England, this ring is also now in the British Museum (O. M. Dalton 1912, no. 720). The hoop to one side of the diamond shows the Virgin and Child, the other depicts the English saint Thomas à Becket. Not all octahedral diamonds in fifteenth-century jewelry were Figure 5.3. (top) Gold ring set with point-cut diamond, probably Italian, late fourteenth century or early fifteenth century. Credit: The British Museum, AF.1011. © The Trustees of the British Museum. All rights reserved. Figure 5.4. (middle) Gold ring set with a point-cut diamond, the shoulders engraved with the Virgin and Child, and St. Thomas à Becket, fifteenth century. Credit: The British Museum, AF.899. © The Trustees of the British Museum. All rights reserved. polished. In their recent book, Yasukazu Suwa, chairman of the Japanese jewelry company Suwa and Son Inc., and Andrew Coxon of de Beers illustrate a late fourteenth- or early fifteenth-century ring formerly in the Hashimoto Collection in Japan and gifted to the National Museum of Western Art in Tokyo in 2012 (Suwa and Coxon 2010, 82–83; Scarisbrick 2004, 59 cat. 146). This has a Norman French inscription—“When you do not see me, think of me”—set with a diamond octahedron that is clearly in its natural state, although it is a very regular stone. Suwa and Coxon contrast this with the clearly polished octahedral faces of a point-cut diamond in another ring from the same collection, in this case of the sixteenth or early seventeenth century (figure 5.5, Scarisbrick 2004, 66 cat. 153; Suwa and Coxon 2010, 82). Figure 5.5. (bottom) Detail of point cut in a Renaissance ring. Credit: National Museum of Western Art, Tokyo, formerly Hashimoto Collection. Photo: Jun Nakamura. The Dawn of Diamond Cutting • 89

Descriptions of Cut The diamonds listed in inventories in the thirteenth century, and for most of the fourteenth, are described simply as “diamonds,” and we must assume that they were probably octahedra, whether polished or not. The usual lack of any qualifying description implies that more extensively cut diamonds were unknown. The occasional descriptions we do have could refer to how they were set—there are more ways to set an octahedral diamond than point-up. As an example, the 1360 s inventory of Louis I, Duke of Anjou, included a fine gold goblet set with various gems, among which were forty-two diamonds. The inventory says that half of these were pointed, the remainder triangular, and the latter described as *plas en triangle* (Moranvillé 1903, 82). *Plas* (and variants such as *plat* and *plaz*) meant “flat,” so perhaps this simply meant diamonds set so that they had a flat upper surface. We find examples of *dyamans plaz* in the accounts of Philip the Bold, Duke of Burgundy, in 1369 and a large diamond *plat en guise d’un escu* belonging to King John II of France (1350–64). “Flat” diamonds also appear in the inventory of Richard II of England (Prost 1902–4, 203; Bapst 1884, 29; Stratford 2013, 234). The term flat diamonds might have referred to polished cleavage fragments or flattish crystals, but octahedra set on their sides also presented a flat, t

triangular appearance. This type of orientation has been encountered with the naturally glossy diamonds in the earlier Eastern jewelry (see figures 3.7 and 3.8), and is well attested in surviving jewelry from later medieval Europe. Some may be triangular cleavage slices, but not all are. In theory, the reflections seen in the stone will reveal whether it is a complete octahedron, or a cleaved half. It is also worth remembering that the high refractive index of diamonds makes them appear far thinner than they really are when set in this way and viewed from above. An example of a diamond set 90 • The Dawn of Diamond Cutting on its side is in the fifteenth-century ring in figure 5.6, which was discovered by metal detector in northern England in 2001 (Treasure 2001, 65). We can see a gold ring set with this type of diamond in a painting dating to about 1460 from the workshop of the painter Rogier van der Weyden. Now in the National Gallery London (inv. NG1433), the *Portrait of a Lady* shows the lady wearing the ring on the third finger of her left hand. There are also diamonds set in this way in several brooches dating from around the 1430s and 1440s found in Flanders, now in the British Museum (figure 5.7) and the Kunsthistorisches Museum, Vienna (figures 5.8 and 5.9). The jewel in Vienna is probably the one listed in a 1544 inventory that describes the diamond simply as triangular (*driegekheten*) (Kovács 2004, 228). As can be seen in figure 5.9, however, none of the three visible corners appears to be an octahedral point. This suggests that this stone is a cleaved slice of diamond (see figure 1.1) that has had its upper surface and sides polished. Which of the other triangular diamonds of this period are sideways-set octahedra and which polished cleavage slices remains to be seen. The triangular diamonds shown in the painting of the “Federlin,” a hat badge made around the early 1460s and looted from Charles the Bold, Duke of Burgundy between 1467 and 1477, following the Battle of Grandson in 1476 (figures 5.10 and 5.11), look as if they are intended as sideways-set octahedra. This painting was made prior to 1504, when the city of Basel sold this ornament.

Figure 5.6. Gold ring with octahedral diamond crystal set on its side, fifteenth century. The empty setting probably contained a ruby originally. Found in northern England in 2001. Credit: Treasure case 2001T24. Creative Commons License, adapted by author.

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ment along with other jewels to the banker Jakob Fugger in Augsburg. It is difficult to work out what type of cut the central diamond is. It appears to be some sort of table, but the upper diamond may be a version of what Tillander terms a “Burgundian pointed cut” (Tillander 1995, 34–36). There is a diamond point “of many faces” (*plusiers faces*) listed in an inventory of 1482 (Finot 1895, 169). Herbert Tillander proposed that diamond octahedra set on their sides to present a triangular appearance might equate with the diamonds described in some documents as *escutcheon*—that is, shield shape (Tillander 1995, 128). Two early mentions are the *escusson* diamonds described as set in a reliquary listed in the 1372 will of Jeanne d’Evreux (1310–71), the third wife of King Charles IV of France (Gay 1887, 549), and two gold rings owned by Charles V of France (reigned 1364–80) (Laborde 1851a, 81 and 94). Octahedral diamonds set sideways, but not on a crystal

Figure 5.7. Gold brooch with sideways-set diamond (top) and a faceted sapphire (center), from the river Meuse, Belgium, mid-fifteenth century. Credit: The British Museum, AF.2768–2769. © The Trustees of the British Museum. All rights reserved.

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face, can appear as a ridged double triangle. Examples include a fifteenth-century gold ring with an inscription in Italian now in the British Museum (see figure 1.8; Ward et al. 1981, 84). The inscription “Loreso a Lena Lena” makes this perhaps one of the earliest surviving diamond-set betrothal rings. The ring in figure 1.9 is of similar date, with a diamond set in this same way next to a ruby. This pairing of a diamond and ruby is matched by a very similar ring now in the Victoria and Albert Museum, which may suggest a

special significance, perhaps a connection with betrothal, as suggested in Chapter 1 (Somers Cocks 1980b, 46). An octahedron set on its side in this way might equate with the diamond *mis en lozenge* (lozenge set) in a ring that Philip the Bold, Duke of Burgundy, purchased from the goldsmith Jean du Vivier in August 1368 (Prost 1902–4, 1364). “Lozenged” seems to have become a general term for “faceted,” however, and this may be an early use of the term in this sense. Figure 5.8. (left) Detail of an enameled gold brooch with triangular diamond, Dutch or Burgundian, ca. 1430–1440. Kunsthistorisches Museum Wien, KK 130. Credit: KHM- Muse umsverband. Figure 5.9. (above) Detail of the diamond in figure 5.8. Credit: KHM Museumsverband. The development of the true point cut in the second half of the fourteenth century probably explains the emergence of the description *naïf*, meaning natural, in inventories. “Naïve,” “naif,” or various other spellings mean an uncut diamond, and the term seems to have been used to distinguish natural octaT he Dawn of Diamond Cutting • 93

Figure 5.10. Watercolor of the “Federlin” feather hat badge, owned by Charles the Bold. The hat badge was made ca. 1460/65, and the painting is from before 1504. Credit: HMB—Historisches Museum Basel, 1916.476. Photo: P. Portner. 94 • The Dawn of Diamond Cutting

hedra from point cuts. For example, we find both pointed and *naif* diamonds listed in a 1424 inventory (Guérin 1873, 299, 300). Other examples are found in the inventories of the Duc de Berry in 1416 and, later in the century, in the inventories of Charles the Bold and René of Anjou (Guiffrey 1896, 290; Laborde 1851b, 126, 175; Quatrebarbes 1846, 145). An alternative, at least by the later fifteenth century, was to describe a diamond as “brut,” such as *un petit diamant brut* in the 1480s and, Figure 5.11. Detail of one of the sideways- set diamonds shown in figure 5.10. Credit: HMB— Historisches Museum Basel. Photo: P. Portner. a quarter of a century later, *une pointe brute de diamant* (Finot 1895, 169, 185). Brut is a French word meaning raw or unrefined, the origin of the English “brute.” We also find pointed diamonds described as *non fait* (unmade), but it is unclear what this meant. It was not synonymous with *naïf*, since the 1416 inventory of the Duc de Berry includes some pointed diamonds described as *naif*, some as *non fait*, and some as both (Laborde 1872, 252). Neither did it mean “unmounted,” since some *non fait* diamonds are described as set in gold rings. A large pointed diamond, surely intended to represent a point cut, is shown set in the “Three Brothers” jewel, one of the jewels looted from Charles the Bold after the Battle of Grandson in 1476 (figure 5.12). The pendant, so- called because of the three large spinels, has a long and well- documented history. Recorded in 1414, when pledged against a loan by John the Fearless, Duke of Burgundy from 1404 to 1419, the diamond was described as “*un gros dyamant pointu à fasce*”—that is, a large pointed diamond with faces or facets (Beaune 1873, 273). This matter- of- fact description is not the earliest, however. An invoice survives showing that the pendant was made in 1398 by T he Dawn of Diamond Cutting • 95

Figure 5.12. Watercolor of the “Three Brothers” jewel as made by Herman Ruissel in 1398. The painting dates to ca. 1500. Credit: HMB—Historisches Museum Basel, 1916.478. Photo: P. Portner. 96 • The Dawn of Diamond Cutting

the Parisian goldsmith Herman Ruissel, who, we saw earlier, was perhaps also a diamond cutter (Kovács 2004, 388). This invoice describes the large diamond as *quarré* (also spelled *carré* or *carrée*). This French term is somewhat problematic. One of the earliest uses would seem to be in the 1360s (Bapst 1884, 29), but it becomes far commoner in the 1380s. In 1380 Charles V of France had a fine diamond well *carré* (Moranvillé 1903, 581 no. 3559; Laborde 1851a, 83). Diamond historians Hubert Bari and Bernard Morel suggested that there was no evidence for cutting before 1400 and that references, as here, to *carré* simply meant a natural octahedron of good square shape (Bari and Sautter 2001, 179). However, this seems unlikely. In August 1388, the Parisian

goldsmith Jehan du Vivier charged Philip the Bold 320 francs to esquarrer a large diamond and set it in a ring (Prost and Prost 1908–13, 439). The fourteenth-century historian Jean d’Outremeuse of Liège wrote several works, including an ambitious natural history and lapidary in four books. The fourth book, recently published by Anne- Françoise Cannella, provides our earliest description of diamond cutting. D’Outremeuse explained how an irregularly shaped diamond crystal could be polished (Cannella 2006, 266). He tells us that “if the diamond is horned or humped, you can resize the horn or the hump and make a beautiful ‘quarree’ stone and of beautiful fashion, polishing it as best you can. But we cannot polish as well as nature polishes” (Cannella 2006, 245). This passage is not precisely dated, but must have been written during the second half of the fourteenth century, prior to the writer’s death in 1400. Intriguingly, Indian texts also use the term horn in the context of diamond shapes. The Garuda Puranam, already centuries old by d’Outremeuse’s day, says, “A diamond with one of its angles or horns broken or mutilated, or looking as if scratched, withered or trampled down, should not be retained in the household, though otherwise possessed of all commendable features, as it would certainly bring hosts of unexpected evils in its train” (Dutt 1908, 183). Quarre, later usually carré, is a French word meaning “square” or “squared,” but with regard to gem cutting, in at least some cases it seems to have been used in a more general sense of faceting. In any case, the use of the term carré applied to diamonds in the 1360s surely indicates that diamond cutting was being done by then. The medievalist and jewelry historian Ronald Lightbown similarly suggested that the word was used to mean “faceted” (Lightbown 1992, 15). Indeed, even in the seventeenth century, the French traveler and gem merchant The Dawn of Diamond Cutting • 97Jean- Baptiste Tavernier used the term carré to describe both simple table-cut diamonds and a large rose-cut diamond he sold to the French king Louis XIV (Bapst 1889, 403–5). A countersuggestion, by Jenny Stratford, that carré literally meant of square shape, may be true in some cases (Stratford 2013, 19). Jewelry taken by the Duke of Bourgogne on his trip to Cambrai in 1385 included a one-piece set with six large spinels, two described as cabochon (cabuissou), two as hexagonal (à huit costs), and two as quarre (Prost and Prost 1908–13, 184). Here “square” might well have been meant, but another spinel owned by Charles V of France in 1380 was described as having eight carrés (Laborde 1851a, 87), presumably meaning eight facets. Early Table Cuts If the point of a diamond octahedron was damaged, it could be smoothed down and polished to form what is termed a table cut. If the top needed to be ground down to any significant extent, bruting may have been used. Table cuts probably originated as early as the fourteenth century and became common in Europe in the fifteenth century onward. For example, inventories reveal that Charles the Bold owned numerous table diamonds, including twenty-four in one object (Laborde 1851b, 111). These may often have been square or rectilinear, as we think of them now, but the term may also have been applied to flat-topped gems of other shapes, from triangular to polygonal. For example, “a table diamond of many faces” is listed in a 1439 inventory (Laborde 1851b, 419). Anna Somers Cocks has pointed out that the Madonna in Jan van Eyck’s Ghent Altarpiece, completed in the early 1430s, is wearing a crown with what appears to be a large point-cut diamond flanked on one side by a very regular triangular-faceted diamond with a flat top • The Dawn of Diamond Cuttingtable (Somers Cocks 1980a, 15). Nevertheless, the square or rectilinear form became the commonest diamond cut in Renaissance Europe and will be discussed later. “Hog- Back” Cuts Flat polishing allowed the fourteenth-century cutter to make use of damaged crystals and variously shaped diamond cleavage fragments. When struck in the right direction with a blade, a diamond will split or “cleave” in a direction parallel with a crystal face (see figure 1.1). The

cleaving of diamonds was well understood in India at least as far back as the fourteenth century. However, it is not until the following century that we start to find diamonds in European jewelry that appear to be various- shape cleavage fragments that have had their faces polished, as in Mary of Burgundy's ring of the 1470s (see figure 1.7). This type of irregular diamond is now usually called a "hog back," a term coined as recently as 1980 by jewelry historian Anna Somers Cocks as an English equivalent of the old French *dos d'âne* (donkey back) (Somers Cocks 1980a, 15; Somers Cocks 1980b, *passim*). Early mentions of *dos d'âne* include a 1446 description of a staff of enameled gold set with a *diamant à dos d'âne* and a diamond cut *en dos d'âne* with many faces listed in Mary of Brittany's 1469 inventory (Morice 1744, 1406–7; Gay 1887, 549). A diamond described as fashioned like a *kirk riggin* (a church roof) that we find in an inventory of James V of Scotland dated 1562 might be a local description of this same form (Thomson 1815, 59–60). To be able to polish the invincible diamond certainly challenged a millennium and a half of widely believed myths about the stone. Those writing about diamonds had to try to blend old beliefs with new knowledge. Thus, Jean d'Outremeuse tells us that goat's blood is mixed with "the diamonds you want to T he Dawn of Diamond Cutting • 99tenderize and soften and they will soon become soft enough to be cut on the lead as with other gems" (Cannella 2006, 245). The lead anciently described as being used to break diamond is thus here identified with the flat lead table on which gems were typically polished (for example, Cannella 2006, 270, 282). In contemplating the birthplace of European diamond cutting, it may be relevant that one of the earliest references to diamond cutting is a document in Hebrew dated 1403, copied with some additions fifty years later, that compares prices on the Venetian market for uncut and cut diamonds, with comments on judging quality (Sirat 1968). The sellers of diamonds to Philip the Bold, Duke of Bourgogne (1342–1404), were frequently of Italian origin, Genoese in particular. For example, the Genoese merchant Pierre Labourebien supplied Philip with an eleven- carat diamond *quarré* in 1387 (Prost and Prost 190813, 283). One of the earliest specific mentions of table- cut diamonds is in an Ita lian inventory, that of Paolo Guinigi, Lord of Lucca in Tuscany, dating to 1430–31 (Lightbown 1992, 37–38). However, Guinigi had been in both London and Flanders, so he may not have obtained his table cuts in Italy. We can note the early use of the term *carat* applied above to weight. A carat is four grains and internationally defined as 0.2 grams today, although varying from place to place until the early twentieth century. Our word *carat* derives, via a plethora of spellings, from the Greek *keration*. It was used as a gem weight in Europe from at least the early 1300s. What is certain is that the ability to polish diamonds created a new market in Europe for poorer quality diamond octahedra and fragments, a development that must have affected the trade dynamics in India and at trading centers in the eastern Mediterranean. Indians would have had a field day with this new market for stones previously unsaleable, while the European elite, and the jewelers working for them, would have had access to a 100 • The Dawn of Diamond Cuttingfar greater number of diamonds and in an increasing variety of forms. The new ability to make use of cleavage fragments may have brought a greater number of larger diamonds into Europe, thus fueling advances in cutting. Before this, the pointed diamonds in Europe were almost invariably small. They were generally the refuse from India, as Marco Polo had said. In 1758 Antoine- Yves Gogue t commented that the diamonds set in a reliquary that Jean, Duc de Berry, had presented to the Abbey of St. Denis in the late fourteenth century, then still surviving in the abbey treasury, were "very small, black and in no way agreeable to the eye" (Gogue t 1758, 116–17). Two diamonds in the 1360s inventory of Jean's brother, Louis I, Duke of Anjou, described then as "very large and very fine," weighed just two carats each

(Moranvillé 1903, 557). A diamond octahedron weighing two carats would measure around nine millimeters tip to tip. There were some larger stones, such as the point cut in the “Three Brothers” pendant, and the so-called Balle de Flandres, which was said to be as large as a walnut (and is possibly an earlier manifestation of the Sancy Diamond), but if the vast majority of diamonds reaching Europe in the thirteenth and fourteenth centuries were far smaller than a garden pea, it is hardly surprising that precision diamond cutting was slow to develop. In summary, we can suggest that the use of diamond powder as a lapidary abrasive was known in Europe no later than the 1200s, probably about the same time that documents show that diamonds were used in medieval European jewelry. The polishing of diamonds may have followed there soon after, but there is no certain evidence for this so far until the later fourteenth century. Until well into the fifteenth century, diamonds were probably being cut and polished by rubbing on a flat surface with diamond powder, and the rotary cutting table or “scaife” was not yet in use.

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1476 Charles the Bold, the last Duke of Burgundy, lost the Battle at Grandson, near the southern tip of Lake Neuchatel in Switzerland, and with it he lost his treasure. That same year, four hundred miles to the northwest, in the city of Bruges in the duke’s Flanders domain, Lodewyk van Berken is supposed to have invented diamond cutting. These two events are linked by more than date. Berken’s first major commission is said to have been the cutting of three large diamonds for the duke. This chapter will consider the usually dismissed claim of Berken’s invention and explain the significant technological advance in the fifteenth century that made modern cutting possible, and ponder whether the two 6 The Fifteenth-Century Technical Revolution really might be connected. The story that Berken invented diamond cutting in 1476, as recorded by Robert de Berquen, claiming to be his descendant two centuries later, has tested the credulity of many (Berquen 1669), the most obvious problem being that diamond cutters and surviving examples of their work are attested from well before 1476. Even the jewelry looted from Charles the Bold at Grandson probably included cut diamonds. However, diamond cutting improved noticeably during the fifteenth century, around the time Berken is said to have lived. The Crank and Belt Drive Diamonds were being superficially polished and perhaps cut in Europe by the fourteenth if not thirteenth century, and, as See figure 6.6. 103 postulated earlier, this was probably carried out by rubbing a diamond on a flat surface with diamond dust mixed with oil or water, much as shown in figure 5.1. This simple technology coupled with the small size of most of the diamonds reaching Europe limited what could be achieved. More precise diamond polishing required the development of smooth, fast, continuous rotary motion, not the back- and- forth of a rubbing table or the to- and- fro of a bow- operated cutting wheel. The secret was the crank and belt drive, one of the most defining technological advances of the later medieval period. The origins of the simple crank, the principle of the bicycle pedal, lay in antiquity. A primitive form of crank drill was used by Egyptian stone vase makers more than four thousand years ago, and there are representations of crank-operated knife- and sword- grinding wheels from at least as early as the ninth century (White 1962, 110). The German goldsmith and monk Theophilus in the early twelfth century described several crank- operated machines for grinding, turning, and cutting, although crank- operated hand mills only seem to have seen widespread use in Europe in the fifteenth century (Hawthorne and Smith 1979, 67, 132–33, 160; Gille 1969, 1446–47). However, the use of the crank alone was not sufficient for accurate diamond cutting where high speed, precision, and minimal vibration were essential. The crank had to be employed in combination with a flywheel and a belt drive. The earliest use of this combination in Europe seems to have been in Italy, where silk- spinning technology from China

was adopted in the thirteenth century, a conclusion reached seemingly independently by Bert Hall (1979, 104) and Edgar Samuel (1980). Samuel has suggested that this spinning technology was first adapted for use in lens grinding for the spectacles then coming into use, and then taken up by the early diamond- cutting industry in the fourteenth century— thereby facilitating the birth and development of diamond cutting • The Technical Revolution in Italy. This is not impossible, but there is little evidence for lens- grinding machinery in Europe before the later fifteenth century at the earliest (Bedini 1967; Hall 1979, 95n39; Uccelli 1944, 66–70; Burnett 2005, 5–7). Even if there was an ultimate Chinese origin for crank- and- drive technology, its application for lapidary work does not appear to have traveled back to the source. The rubies (or red spinels) and sapphires that are quite abundant in the Ming Period (1368–1644) Chinese jewels seem never to be faceted, and a seventeenth- century representation of a Chinese lapidary worker in the T'ien- Kung K'ai- Wu shows him using a foot- powered, to- and- fro cord- operated mechanism, not any form of crank (Sung, Sun, and Sun 1996, 306). The earliest illustrations of crank, flywheel, and belt- drive gem- cutting wheels date from the fifteenth century. One is shown in a manuscript, now in the State Library in Munich, known as the Anonymous of the Hussite Wars, more formally as *Codex Latinus Monacensis* 197. Here folio 23 verso rather crudely illustrates a gem- polishing mill where a crank works a large wheel that drives a continuous rope that passes over two pulleys to rotate a cutting wheel on a vertical spindle (figure 6.1). The accompanying German inscription says, “This is a polishing mill like that the grand masters of Venice have, on which one polishes all sorts of stones; it requires three polishing disks, the first is lead, the second is tin, the third copper” (Hall 1979, 94–95, 173, and fol. 23v). Although a date for this manuscript of around 1430 is often cited, Bert Hall has argued on the basis of the watermarks that the section of the manuscript that includes the gem- polishing mill is to be dated to around 1472–75 (Hall 1979, 28–34). This drawing would seem to be based on the same source as another crank- and- rope- driven gem- polishing machine illustrated with far greater precision and sense of scale in a manuscript in the Bibliothèque Nationale de France, Paris (figure 6.2). Here can be seen the same arrangement of a large T he Technical Revolution • 105

Figure 6.1. A crank and belt- drive gem- cutting machine illustrated in the *Codex Latinus Monacensis* 197, fifteenth century. Credit: Bayerische Staatsbibliothek München, Clm 197, I. fol. 23v. 106 • The Technical Revolution

flywheel and a cord passing over two small side wheels to power a cutting wheel on a vertical axis, as shown in the reconstruction in figure 6.3. The crank handle itself, or perhaps treadle, is not shown, but the square hole into which it would be inserted is. This drawing is attributed to Henri Arnaut de Zwolle (ca. 1400/1466), who worked for Philip the Good, Duke of Burgundy, as physician, astrologer, and organist. The reason a doctor would depict a gem- polishing machine is explained in the Latin caption: “This instrument serves to polish precious stones; the collected fragments have secondary medical use.” The medicinal use of gems in Europe even in Renaissance times was extensive; a list of jewelry and gems taken out of the Tower of London in 1600 includes “258 emroddes [emeralds] very foul, only fit for apothecaries” (Giuseppi 1904, 356). A second drawing in the same manuscript shows another gem- working machine including a crank handle. The way in which this operated is less clear, but it includes a sophisticated mechanism for setting cutting angles (figure 6.4). These drawings, if indeed by Arnaut, must date from prior to his death from the plague in Paris in 1466, although Bert Hall again suggests that the section in which these drawings appear may be slightly later (Hall 1979, 95n39). Hall also pointed out that, like the earlier spinning wheel, this lapidary equipment was “designed for light duty and thus slippage was less of a problem [than it would be for most

industrial purposes]” and adds: “Why it evolved only in the later fifteenth century is an unsolved mystery” (Hall 1979, 105–6).¹ There is no indication that the sort of machines shown by ArFigure 6.2. (bottom left) Illustration of a gem- cutting machine, probably by Henri Arnaut de Zwolle, ca. 1400–1466. Credit: Bibliothèque nationale de France, MS Latin 7295, fol. 137r. Figure 6.3. (bottom right) Reconstruction of the gem- cutting machine in figure 6.2. 3D image: Jack Ogden. The Technical Revolution • 107

Arnaut and the anonymous draftsman of the Munich manuscript were intended for diamond cutting, although this has been assumed (for example, Samuel 1980, fig. 2). The Munich manuscript, although not mentioning abrasives used in conjunction with the wheel, describes the wheels themselves as being lead, tin, or copper, not the iron (or steel) later usual for diamonds. The use of polishing surfaces of different materials—wood, lead, Figure 6.4. Detail of the angle gauge from a drawing of a gem- cutting machine, probably by Henri Arnaut de Zwolle, ca. 1400–1466. Credit: Bibliothèque nationale de France, detail of MS Latin 7295, fol. 138v. 108 • The Technical Revolution and copper—for polishing colored gems is also described in a fourteenth-century manuscript in Vienna, but there is no indication here as to whether these were for rotary or flat polishing, and although sapphire, emerald, ruby, and topaz are mentioned by name, there is no mention of diamond (BnF Latin MS 407, fol. 147r—see Thorndike 1960, 16–17). Arnaut’s reference to the secondary, medicinal uses of the dust generated in gem polishing would also exclude diamond, where the diamond dust generated had a far more immediate and important function—serving as the cutting abrasive itself. Nevertheless, the clamps for holding the gems and the angle-setting mechanism in the Arnaut drawings do show that flat surfaces—facets—were intended, not cabochons or more rounded forms. The belt- drive mill on which the “Grand Masters” of Venice polished colored gems was the direct ancestor of the diamond- cutting mill. Rotate the large flywheel up to the horizontal plane, and the resulting equipment is almost identical to the diamond-cutting mills that became popular in the following century. The Berken Controversy The essential and innovative step that would allow the cutting of diamonds on machinery of this type was to make the wheel of iron. At this point a name springs to mind: Bruges- based Lodewyk van Berken. According to Robert de Berquen (1615–1672), one of his ancestors in Bruges, Lodewyk, in 1476 and in “a singular spirit of genius” invented the cutting of diamonds using diamond powder and an iron wheel (Berquen 1669, 13). Charles the Bold, we are told, commissioned him to cut three important diamonds, one of which was probably a large diamond lost by Charles at the Battle of Grandson. Lodewyk was later celebrated in popular culture; there is a bronze statue of him in Antwerp, and he was even the subject of a musical play—*Berken de diamantslijper*—by Karel Versnaeyen published in Antwerp in 1868. However, his claim to fame has been met with considerable derision by numerous scholars because there is ample evidence of diamond cutting for at least a century before his supposed invention. An early decrier was Jacques T  xier in the eighteenth century, who dismissed the existence of Lodewyk van Berken and noted that the Bruges archivist Pierre- Jacques Scourion (1767–1838) had found no trace of a Berken (T  xier 1857, 640). Indeed, Alexandre de Laborde mentions Scourion’s archive research when he quotes a 1465 case of an amethyst sold as a spinel in Bruges (Laborde 1872, 251). The experts consulted here were described as *diamantslypers*, namely Jean Bellamy, Chretien van de Scilde, Gilbert van Hitsberghe, and L  onard de Bruck  re. Another Berken skeptic was the famous nineteenth- century Italian jeweler Augusto Castellani (Castellani 1871, 85). Once into the twentieth century, Berthold Laufer poured scorn on how Berquen “soars into this panegyric of his ancestor,” and most jewelry historians since have said much the same (Laufer 1915, 49n). Diamond expert Godehard Lenzen summed up the whole

Berken story as “an unfounded opinion and a convenient myth” (Lenzen 1970, 72–73). Most agree that, at best, Berken may have improved faceting in some minor way. Have we been unfair to Lodewyk van Berken? His descendant Robert explained that Lodewyk rubbed two diamonds, one against the other, and then used the diamond dust that fell T he Technical Revolution • 109 from this operation in conjunction with an iron wheel to cut the diamonds with a perfect polish (Berquen 1669, 14). The first stage here, the process by which a diamond is roughly ground to shape by rubbing against another diamond, is known as “bruting.” This may well have been an old process by Berken’s time. What is significant is the focus of Robert de Berquen’s statement: his ancestor polished the diamonds “using the mill with some iron wheels he had invented.” An iron wheel was a necessity for the precision cutting of diamonds, and there is no evidence that such existed before Lodewyk van Berken’s lifetime. However, there are still challenges to Robert de Berquen’s account. One is the existence of a small and very precisely faceted, pear- shaped diamond se t in the so- called Burgundian Court Goblet, a beautiful rock crystal, gold, and gem- encrusted goblet now in the Kunsthistorisches Museum in Vienna (figure 6.5; Tillander 1995, 206). This goblet was described in an inventory of 1467, and so the diamonds must have been cut at least a decade before Lodewyk van Berken’s supposed invention. Although basic forms, such as point cuts, “hog backs,” and tables, might be cut on a stationary, flat table, more precisely arranged and numerous facets as with the pear- shaped diamond in the Burg undian Court Goblet probably needed a precise, rotary wheel. Another problem concerns timing. In 1476 Charles the Bold was at war. In January and February that year he was moving south, through France and across the Jura mountains into what is now Switzerland, beginning his assault on Grandson on February 21 and culminating in his ill- fated battle th ere on March 2. It seems improbable that while preoccupied with these maneuverings (crossing the Jura in winter with an army was no simple matter), he learned of Berken’s invention some three hundred miles away, sent him three major diamonds to cut, received them back, and had one mounted, all in time for him to lose it at the battle on the second day of March, if we 110 • The Technical Revolution

Figure 6.5. Faceted pear- shape diamond, almost ce rtainly with a flat base, set in the foot of the so- called Burgundian Court Goble t, 1453–1467. Kunsthistorisches Museum Wien, KK 27. Credit: KHM- Museums verband. accept that it was lost at Grandson. Berquen says the duke lost the large diamond a year later at the Battle of Nancy, where he also lost his life, but, as Charles King pointed out, by then he had no important diamonds left to lose (King 1867, 106n).² T hings may make slightly more sense if we could push Berken’s invention back a decade or more, to the 1460s or even slightly earlier. This is not impossible. If we assume Robert de Berquen’s tale has a kernel of truth, he can hardly be expected to be exact. Indeed, he openly admitted that he would tell the story “roughly.” Oral traditions in a family are seldom accurate after two centuries. Corroborating evidence for an earlier date might be seen in Robert van Berquen’s comment that another of Charles the Bold’s three diamonds, once cut, was given by him to King Louis XI. By the 1470s Louis was Charles’s archenemy. A gift to him of a large diamond would be far more likely durT he Technical Revolution • 111 ing their negotiations in the 1460s than in their fractious 1470s. T here is a tantalizing postscript here. The Belgian Jesuit scholar François- Xavier de Feller, in his monumental *Dictionnaire historique* published in 1781, briefly mentions “Louis Berken,” a native of Bruges who “invented the cutting of diamond around 1450” (Feller 1781, 403). This is repeated, with skepticism, a few years later by his fellow countryman P. J. Heylen. Whether this 1450 date was a transcription error or based on some now lost source is unknown. Incidentally, Edwin Streeter dated Berken’s supposed invention to 1456, here almost certainly a typographic

error (Streeter 1877, 24). Whether Lodewyk van Berken invented diamond cutting with a rotary iron wheel, modified a slightly older technique, or is a completely fictitious character, there seems little doubt that the fifteenth century saw a significant step forward in diamond cutting and that the development of the rotary iron scaife played a major role in this. The earliest specific mention of a diamond- cutting mill would seem to be from 1496, when Jehan Cayon of Lyon was paid for dressing, cleaning, and putting on his mill (*rabillé, nectoié et mis sur son molin*) a beautiful pointed diamond for Anne, Duchess of Brittany from 1488 to 1514 (Le Roux de Lincy 1860, 4: 109). Cayon is described as a *dyamentier*, an early use of the term *diamantaire* for a cutter of diamonds, but not the earliest; a 1470s Geneva example was noted above. The development of diamond cutting also needed a regular supply of reasonably large diamonds. As we have seen, most of the diamonds in surviving fourteenth- century jewelry are small. In the early sixteenth century, the Italian metallurgist Vannuccio Biringuccio noted, “According to hearsay, the largest [diamond] that has yet been found in the world is little less than half a walnut” (Smith and Gnudi 1990, 122). This is larger than the hazelnut comparison given by Pliny and smaller than the 112 • The Technical Revolution “walnut- sized” diamond supposedly lost by Charles the Bold at the Battle of Grandson in 1476. The evidence would seem to suggest that the first half of the fifteenth century saw an increase in the number of larger diamonds reaching northern Europe. It is possible that one important player here was the French merchant Jacques Coeur (ca. 1395–1456), a highly significant figure in the Levant trade whose extensive network and large fleet brought to France many Eastern commodities, including gems. By the time of Coeur’s death, the expansion of the Ottoman Turks had conquered Constantinople, largely closed down European trade in the eastern Mediterranean, and destabilized the overland Silk Route. This curtailment of European trade prompted the search for alternative ways east, a search that within a few decades led to the finding of a sea route to India—the land of diamonds. The Diamond- Cutting Mill The introduction of crank- and- belt- driven iron cutting wheels— what are termed “scaifes”—in the fifteenth century largely explains the blossoming sophistication of diamond cuts in Renaissance jewelry. An early description of the brutting and polishing of diamond is by Vannuccio Biringuccio around the year 1530, but only published in 1540, a year after he died (Smith and Gnudi 1990, 122). He says, “The art of grinding it [diamond] and of making it lustrous and reducing it to a square, oblong, or angular form, is by long and continued rubbing with another diamond and of working it with its own powder, on a wheel of tempered steel, then of copper and then of lead, depending on the degree [of polish] that is to be attained.” Some thirty years later, Biringuccio’s compatriot the goldsmith and sculptor Benvenuto Cellini said much the same (Ashbee 1967, 31–32): The Technical Revolution • 113 Diamonds you can never cut alone, you must always do two at a time on account of their exceeding hardness, no other stone can cut them; it is a case of diamond cut diamond. This you do by means of rubbing one against the other until a form is obtained such as your skillful cutter may wish to produce, and with the diamond powder that falls from them in the process, the final polish is subsequently given. For this purpose the stones are set in little cups of pewter and held against a wheel by means of certain little pinchers prepared on purpose, and they are thus held with their dust mixed with oil. The steel wheel upon which the diamonds are cut and finished should be about the thickness of a finger, and the size of an open hand and of the finest steel excellently tempered. This wheel is fastened to a hand mill and turned round as fast as it is possible to turn it. Four to five diamonds, or even six, can be applied to the wheel at the same time, and by bringing to bear a sufficiently heavy weight you can increase the pressure of the diamonds upon the wheel and give greater grip to the

dust which wears them away, and so they are finished. In Europe, the earliest representation I know of a diamond cutting mill, contemporary with Cellini and Biringuccio, is that in figure 6.6, an illustration heading the section on *adamas* in the 1551 *Naturalis Historiae opus novum* by the Marburg theologian and philologist Adam Lonizer (1528–1586). Here a jeweler's shop is shown with a splendid inventory on display and even a royal customer, while in the background an assistant turns a large wheel with a crank to work what appears to be a diamond mill. The drive shafts and gearing seem overly complex and may have been designed for water as well as hand power, but the basic, sturdy wood-framed mill is similar to later such depictions. As we shall see, there was a water-powered diamond mill in Paris in the 1530s. The edition of Lonizer's work shown here 114 • The Technical Revolution

Figure 6.6. Jeweler's shop with a diamond-cutting mill. From the 1551 *Naturalis Historiae opus novum* by the Marburg theologian and philologist Adam Lonizer. Credit: Mannheim University Library, Sch 106/345. has later rather garish coloring, with even the point-cut diamonds set in jewels below the workshop scene so augmented.³ The simple crank on the curious diamond-cutting machine that Anselmus de Boodt of Bruges (1550–1632), one of the fathers of modern mineralogy, illustrated at the beginning of the seventeenth century and which he says he invented (figure 6.7) would not provide the fast, even rotation required for diamond cutting (Boodt 1609, 39). This machine was intended to cut many diamonds at the same time, but was probably never made. It is surprising that de Boodt seems unaware of the drive mechanism and heavy framed diamond-cutting mill that had become standard by his time. The type of machine shown by Lonizer remained in use into relatively modern times. A 1694 drawing by the Dutch artist Jan Luyken (figure 6.8) is a good example. In both Lonizer's and Luyken's representations, we see the large drive wheel to provide high speed and momentum, and a weighty wood frame to ensure the stability essential for precise cutting. In essence, the mechanism here is the same as the fifteenth-century lapidary machines, but the drive belt and wheel are rotated to the horizontal, so that both cutting and drive wheels have vertical axes. The very large drive wheel allows the

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Figure 6.7. Multiple diamond-cutting machine invented by Anselmus de Boodt of Bruges. After Boodt (1609), 39. high speed; the solid, weighty wood frame ensures the stability essential for precise cutting. This type of diamond-cutting mill was also illustrated by André Félibien, the court historian to Louis XIV of France, in his monumental 1676 *Des principes de l'architecture* (Félibien 1676, 2:365). Félibien accompanied his drawing with a description of the diamond-cutting process. In addition to explaining how facets were cut on diamonds using a scaife of soft iron and diamond powder, he mentions, like Cellini, how rough diamonds were bruted, a process that generated diamond dust (Félibien 1676, 2:359–60). Gems such as ruby, sapphire, and oriental topaz (yellow sapphire), on the other hand, he tells us, were cut on a hand-turned copper wheel using diamond powder and polished with tripoli powder (Félibien 1676, 2:360). The Dutch geographer Johan de Laet (1581–1649) had earlier described the cutting of diamonds in some detail in his 1647 *De Gemmis et Lapidibus* published in Antwerp (Laet 1647, 5–6). 116 • The Technical Revolution

Figure 6.8. Diamond cutting. Jan Luyken, *Diamantslijper*, 1694. Credit: Collection Amsterdam Museum, RP-P-OB-44 536. The cutting, he says, was carried out on an iron wheel fed with diamond dust mixed with oil. He rejects the idea of putting excess weight on the stone. De Laet provides no depiction of the diamond mill or explanation of how it was powered, but we can assume that it was the sturdy, classic type of diamond-cutting mill. Alternative Power

Sources Turning a crank evenly and as fast as possible, as Cellini instructs, was not easy. The merchant, politician, and writer Gerard Malynes, who ran diamond mills in the sixteenth century,

noted that even a small diamond might take three or four days on the mill, taking “much time and labor to polish them” (Malynes 1622, 75). When an Isaac Silver was indicted for theft in London in 1759, it was said that “he works at turning a wheel for a diamond- cutter , which is hard work” (Old Bailey Proceedings: Accounts of Criminal Trials, 30 May 1759). So, alternative power sources were tried. In the 1530s, Matteo del Nassaro, known in France as Mathieu d’Alnazar, was paid to construct a water- powered mill to polish diamonds, emeralds, agates, and other types of gems in Paris (Laborde 1880, 370; La Tour 1893, 9–10). Del Nassaro was a goldsmith and gem cutter, originally from Verona, who worked for some time in France at the court of King Francis I. A water- powered diamond- cutting wheel is also said to have been used by Philip Holbein (grandson of celebrated artist Hans Holbein), who was described as a diamond cutter and royal jeweler from Lisbon in the later sixteenth century (Thieme- Becker 1907– , s.v. “Holbein, Philipp I”; Stetten 1779, 144). A water- powered diamond- cutting wheel would not be out of place in sixteenth- century Europe, where the combination of cranks and waterwheels had already revolutionized industry, as so copiously illustrated by the father of 118 • The Technical Revolutionmineralogy, Georgius Agricola, in his *De Re Metallica* (Agricola 1955, passim). The complex gearing for the diamond mill in figure 6.6 would appear to be suitable for water power. Agricola also illustrated various machinery operated by horsepower, and the silversmith, sculptor, and gem cutter Hans Lobsinger is credited with the invention of a horse- powered diamond mill in the first half of the sixteenth century in Nuremberg (Feldhaus 1952). According to Lobsinger, his machine could drive three mills, and he named Paulus Koch as one of the several diamond cutters in that city who were using his invention. He notes this machine and numerous other inventions of his in a petition to the magistrates of Nuremberg when he had financial problems in 1550. This is nearly three centuries before horse- powered diamond cutting is supposed to have been introduced into Amsterdam (Elliott 1832, 23). Later, steam power came into use, and a small steam engine was used in the recutting of the Koh- i- Nur in London in 1852. The Iron Scaife De Laet’s and Félibien’s mention of an iron scaife, a slightly later version of which is shown in figure 6.9, is significant. Both Cellini and Biringuccio in sixteenth- century Italy specifically said the scaifes were made of steel. At about the time Félibien was writing, the French gem merchant and traveler Jean- Baptiste Tavernier scorned the poor quality of diamond cutting in India compared with that in northern Europe (Ball 1889, 2:45). One reason for this, he says, was that the Indians used steel scaifes rather than what he described as the better- performing cast- iron ones employed in Europe. He explains that cast iron was better than steel because it could be easily filed smooth. He also noted that the Indians overweighted their wheels. It thus seems that Indians in the seventeenth century were using diamond- cutting The Technical Revolution • 119Figure 6.9. Iron scaife on a diamond- cutting mill, probably eighteenth century. Credit: Diamond Museum, Amsterdam. Photo: Jack Ogden. 120 •

The Technical Revolution equipment of a type that was used in Italy in the fifteenth century but then superseded there by improved mills with iron scaifes. Robert de Berquen had specifically attributed the invention of the iron scaife to his ancestor Lodewyk van Berken in Bruges in 1476, as we saw earlier. This is tantalizing. If Berken existed, did he invent the steel scaife, but his descendant assumed it was iron because that was normal by his day? Or did the steel scaife pre- date Berken, who improved on the cutting process by replacing it with one of iron? If sixteenth- century cutters in northern Europe were using iron scaifes, but those in Italy, as described by Biringuccio and Cellini, still used the inferior steel ones, it might be one reason why the northern cutting centers became preeminent. Angle Gauge and Dop The crank and belt drive were not the only innovations

that were crucial in the development of sophisticated diamond cutting. The diamond had to be held firmly against a cutting wheel in a way that allowed precise adjustment of angle and position. Even with the earlier rubbing of gems on a fixed table, the fingers alone would seldom have served, and as Theophilus described in the twelfth century, the stone was attached to the end of what is now called a “dop stick” using pitch. Experienced cutters can produce remarkably accurate cuts with just a simple dop stick or dop stick in conjunction with a notched wooden board, but precision is facilitated by using a stone holder fixed onto an adjustable support. Two gem holders were shown by Henri Arnaut de Zwolle in his drawing now in the Bibliothèque nationale de France, one on each side of the wheel (see figure 6.2). These held the gems in fixed positions against the wheel. The quadrant measuring device also shown by Arnaut (see figure 6.4)—the medieval equivalent of the lapidary “angle gauge”—has thirty- two divisions to the right angle, a number that would allow a variety of facet angles to be cut accurately. This quadrant pre- dates by almost a century and a half the one illustrated by de Boodt in 1604 and which Grodzinski considered to be the earliest (Grodzinski 1953b, 4–5). Today a lead- tin alloy “solder” is used to hold the diamond on the dop, and this too has a long history. De Laet referred to this lead- tin solder in his description of diamond cutting, and a century earlier Cellini talked of “pewter” being used—that is, a lead- tin alloy (Laet 1647, 5). A generation after Cellini, in 1597, the English poet Michael Drayton equated the budding beauty of Jane Shore, Edward IV’s mistress, with “an uncut diamond in lead, Ere it be set in some high- prized ring” (Drayton 1753, 1:329). This could be a reference to the rough diamond set in lead on a dop awaiting cutting, or an early mention of the practice of casting a rough diamond in lead so that its cutting could be planned. Before the adoption of these new cutting techniques, diamond shapes, as described in inventories, are still usually relatively simple. For example, in an inventory from around 1430, we find diamonds described as pointed, flat, naïf, square pointed, flat with three sides, with three lozenges, and “escutcheon” (see, for example, Finot 1895, 161–63). We often find the flat face polished on a diamond described using the French term *face* and variants such as *fasse*. Examples include several diamonds described as a *fasse* owned by Charles the Bold (Laborde 1851b, 45, 11, and 116). As the end of the fifteenth century approached, we begin to find more descriptions of diamonds with many faces (for example, Finot 1895, 169, 197). The first use of the word *face* for a facet on a diamond that I have found in Britain is from 1578, in an inventory of the jewelry received by Mary, Queen of Scots, from James Hamilton, Duke of Châtellerauld (Thomson 1815, 265–67). Bruting Robert de Berquen refers to his ancestor Lodewyk van Berken rubbing two diamonds together to grind them to approximate shape prior to cutting and polishing them on the wheel. This was the process we call “bruting.” De Laet similarly explained how two diamonds were rubbed against each other until the sides and corners were made even, the dust being collected below them in a bronze box—as illustrated by Félibien and the eighteenth- century *Encyclopédie* of Diderot and d’Alembert (figure 6.10). Both Biringuccio and Cellini indicate that the bruting stage was a laborious one. The former talks about “long and continued rubbing with another diamond,” and the latter refers to “rubbing one against the other until a form is obtained such as your skillful cutter may wish to produce.” More recently, George Harlow, curator of gems and minerals at the American Museum of Natural History, has described the 122 • The Technical Revolution

Figure 6.10. Bruting diamonds. Credit: From the eighteenth- century *Encyclopédie* of Diderot and d’Alembert. “great force” needed to grind the two diamonds together and notes that “when bruting was done by hand, craftsmen often suffered long- term damage to the ir hands and wrists” (Harlow

1998, 232). The term bruting comes from “brute diamond,” a rough or uncut diamond, from the French *diamant brut*, which as we have seen was a term in use by the late fifteenth century in France and not long after in England (for example, Malynes 1622, 75). Diamond Powder The descriptions of diamond cutting from Biringuccio and Cellini onward make it clear that the diamond powder produced in the bruting process was used to cut the diamonds. However, not all the diamond powder used by a diamond cutter, let alone other lapidaries, could be generated from diamonds being bruted and cut. Agricola in the mid- sixteenth century specifically explained that diamond powder was “brought from India by the Lusitanians [Portuguese]” (Agricola 1955, 114). He also noted in the context of other lapidary work that “it costs the The Technical Revolution • 123 engraver [of gems] little to use emery: a considerable sum to use diamond” (Agricola 1955, 115). That diamond powder was an item of commerce from India in the fifteenth century raises questions as to how old this trade was and whether any diamond powder used in European lapidary work was produced in Europe prior to the Renaissance. Diamond powder was best produced by crushing what is termed *boart*, diamond of too poor a quality for gem use. An early use of the term (spelled *bord*) occurs in an account of the costs of cutting two diamonds for Queen Elizabeth I dated 1596 (Salisbury 1915, 588–89). In 1665 Robert Boyle noted that one London diamond cutter “makes much of his powder to polish diamonds with, only by beating board [*boart*] diamonds (as they call them) in a steel or iron mortar, and that he has by this way made, with ease, some hundred carrats of diamond- dust” (Boyle 1738, 145). In 1607 William Hawkins went on the third East India Company voyage to negotiate trade with the Mughal emperor Jahangir. He recounts how a diamond cutter was summoned to the emperor’s court to cut a diamond of about sixty carats (Foster 1921b, 112). The cutter requested “a small *foule diamant*” that he might grind to make powder, but despite being brought a huge chest full of diamonds, he was unable to find one of poor enough quality. This probably reflects the quality of Jahangir’s diamonds as much as a dearth of poor diamonds in India.

Diamond Sawing In addition to bruting and cutting diamonds, there was a further process developed during the Renaissance—diamond sawing. This process was perfectly explained in a mid- nineteenth- century account: “The diamond is cemented to a small block of wood which is fixed firmly to a table, and a line is made with a sharp [a small piece of cleaved diamond] where the division is 124 • The Technical Revolution intended to take place, which is afterwards filled with diamond- powder and olive- oil: the sawing is then commenced, and if the stone is large, the labor of eight or ten months is sometimes required to complete the operation. The saw is made of fine brass or iron- wire, attached to the two ends of a piece of cane or whalebone, the teeth being formed by the particles of diamond- powder, which become imbedded in the wire as soon as it is applied to the line” (Anon 1848, pt. 3, 85). I am not aware of any firm evidence for sawing diamonds before the early seventeenth century, when we have documentation from 1613 showing the presence of several diamond sawers in Antwerp (Kockelbergh et al. 1992, 93). It may have been a relatively new process then because in 1647, Johan de Laet described sawing as a recent innovation (de Laet 1647, 6). He described sawing as elegant; cleaving a diamond was faster, but more prone to damage the stone, although, he adds, experts rarely made a mistake. Cleaving—de Laet uses the Latin term *f indendus*—is the splitting of a diamond when firmly struck in the right direction with an iron or steel edge. Several seventeenth- century writers mention diamond sawing, and although laborious, it must have been widespread. Such writers include André Félibien and, a few years later in England, Nehemiah Grew, who reported: “Our European Jewelers, when they split one [diamond], they take a very small iron Wyre, and having daubed it with Oil and Powder

of Diamond; draw it upon the Diamond, by a tool, to and fro like a saw” (Félibien 1676, 2:359–60; Grew 1681, 282). A mention of diamond sawing also occurs in a brief and rather bizarre manuscript in the British Library titled “A proposeall for Buyeing of ruffe Diamonds” (Egerton Mss. 3352, fol. 207). This suggested that diamonds for the king could be cut at court to keep costs down, as was being done in France. The manuscript notes that “the king [is] to pay for cutting and slitting and saweing.” The English king referred to is not named, but is presumably Charles II, since the text mentions the French king’s minister “Colbert”—this is Jean- Baptiste Colbert, whom Louis XIV appointed as Contrôleur- Général des Finances in 1665 and who died in 1683. Louis XIV, of course, was the great client of Jean- Baptiste Tavernier. The extremely laborious sawing of a diamond with diamond dust, oil, and a wire was rendered obsolete by the introduction of the mechanical sawing of diamonds at the beginning of the early twentieth century. This revolutionized the diamond- cutting industry, in particular making it easier for a single octahedral crystal to be cut in two to allow the production of two brilliants rather than just one. More recently still, laser cutting has provided even greater speed and precision. The second half of the fifteenth century had been a momentous one for the European lapidary industry, diamond cutting included. The rotary scaife was introduced using a crank and flywheel, a combination that permitted precise and miniscule faceting. Whether or not Lodewyk van Berken was the first to employ such technology in diamond cutting, the craft entered a new age, bringing sparkle to Renaissance jewelry and a gradual standardization of cutting styles. So effective was the technology that it remained essentially unchanged into modern times. The introduction of diamond sawing widened the scope for diamond cutters to create fine- cut stones from the rough at their disposal. The development of cutting must also have had a significant impact on the economics and dynamics of the diamond trade by adding a new stage at which value could be added and margins made. In 1575 the Franciscan priest and cosmographer André Thevet told of a Venetian merchant in Alexandria who bought a rough diamond from an Indian for a low price. After cutting and polishing [*polir et nettoyer*] it, he had a diamond of “marvelous beauty” that he sold for twelve thousand ducats (Thevet 1575, 411b).

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The development and wider adoption of diamond cutting slowly displaced the old myths about lead and goat’s blood, but didn’t entirely oust them for some time. In the first decade of the seventeenth century, William Heth hedged his bets by saying that diamond “is of marvalous hardnes in so much as it can nyther be cutt without the powder of it selfe or brooke without the blud of a goate” (Heth 1603, 62v).

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The sixteenth century marked a new era of lavish jewelry and copious use of gems in Europe, fueled by the new direct sea trades with Asia and the Americas and, in the case of Britain, the huge “liberation” of gems and religious treasures following the dissolution of the monasteries. The diamonds set in Renaissance jewelry take a bewildering variety of forms. These were categorized by Herbert Tillander (1995), but a modern classification of historical objects does not always reflect how they were considered originally. With diamond cuts, classification of the myriad forms can bring with it an implication of more intent at diversity in 7 Renaissance Table and Point Cuts the past than is warranted. The Renaissance diamond cutters were experimenting and using their newfound skills to convert a wide variety of crystal shapes, cleavage fragments, and older cut stones into polished gems to delight their patrons, while best minimizing weight loss. Inevitably, there were a plethora of shapes, some more satisfactory than others, until some standardization manifested itself. We can see this in inventories and other documents where authors initially described the shapes as they saw them, with a uniform nomenclature only gradually appearing. Descriptions of Diamonds We encounter

simple, matter-of-fact descriptions of diamonds in a list of King James V of Scotland's jewelry that was in the Pendant with a large point-cut diamond, from the Jewel Book of the Duchess Anna of Bavaria, 1552–1555. Credit: Bayerische Staatsbibliothek München, Cod. icon. 429, fol. 42r.

129Jewel House in Edinburgh in 1542 (Thomson 1815, 59–60). There were table diamonds, a table diamond fashioned like a heart, and one fashioned like a kirk riggin —Scottish for a church roof, and so presumably the stone was something like a “hog back,” as discussed in Chapter 5, like the diamonds in Mary of Burgundy's ring (see figure 1.7) or in an IHS pendant of about 1580–1600 in the Victoria and Albert Museum, London, a detail of which is shown in figure 7.1. A pendant with a design of this type is shown in the 1552 Jewel Book of the Duchess Anna of Bavaria, now in the Bavarian State Library (fol. 22). King James V's jewels also included a diamond described as thick and raised high but without a point, one that was three-cornered (three nuikit —nooked, like the English “nook,” meaning a corner), long on one side, a large diamond small at one end and great at the other, and another with one “small tail” and large at the shoulder. One table (tablit) diamond was “cuttet under,” presumably meaning faceted at the back. A more cursory approach to descriptions is seen in a 1600 appraisal of “old jewelry” from the Tower of London. Here, apart from a diamond described as pointed and some “sparks” (see below), these jewels were categorized simply as “fair,” “lesser,” “mean,” or “counterfeit” (Giuseppi 1904, 356). A list of jewelry dated 26 June 1527 that had belonged to Thomas Cromwell, chief minister to King Henry VIII, included among the rings “another a table diamond, another a triangular diamond, another a rocky [rough] diamond” (Brewer 1872). A list of jewels sent to Henry in 1514 includes the usual pointed and table diamonds, but one table was described as “rising with Lozenges.” There was also “a harte [heart] of dyamant, rising full of Lozenges”—the description “heart” then was applied to what we call a pear shape (Strype 1594, 7–8). This is presumably the same as the “lozenged diamond like a heart” in a list of the king's jewels in 1532, a collection that also

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Figure 7.1. Detail of an IHS pendant set with hog-back diamonds, ca. 1580–1600. Credit: Victoria and Albert Museum, London, M.248–1923. Photo: Jack Ogden. contains “a lozenged diamond like a shield,” “2 great table diamonds square-lozenged,” and “one long lozenged diamond” (Gairdner 1880, 736). A list of jewels pawned by King Maximilian I in Nuremberg in 1491 had included two bracelets, each set with a beautiful table diamond that had been “lozenged” (lozengiet) (Hackenbroch 1979, 395). These examples show that the term lozenged was a synonym for faceted, and indeed a century later Thomas Corneille explained that diamonds were cut in facets or lozenges (à lozange) to cover their imperfections (Corneille 1694, 1:318). The term triangled used in September 1532 to describe a diamond might also have meant faceted (Gairdner 1880, 555). In England, a range of diamond forms was cited by the merchant and government adviser Gerard Malynes, who had run cutting mills in the 1580s and was thus well acquainted with the subject: “Some are faire Triangles, others Flower de Lucas [fleur de lis], Roses, Harts, Columes, Demy Crosses, or other fashions of Poly Angles and proportions serving for the members or parts of the bodies of things to bee made into many workes and lewels, as the lewellers will apply the same, cut with many Renaissance Table and Point Cuts • 131

Fassets or Squares” (Malynes 1622, 74–75). Here the “other fashions of Poly Angles” may have included hog backs, and the equation of “Fassets” (facets) with “Squares” supports the view that the French carré was also a synonym for facet. In the mid-sixteenth century, the Italian goldsmith and sculptor Benvenuto Cellini made the elegantly concise statement that diamonds were cut in “three lovely shapes”—table, faceted, and point (tavola, a facette, e in punte) (Ashbee 1967, 31). Of course, all three of these cuts have

facets, but Cellini presumably uses *facettoi* to mean having more elaborate facets than just the faces of simple point or table cuts. The term *facet* as used by Cellini is first found a century earlier, by the mid- fifteenth century , and from that same period we even have the term *facetter* applied to a diamond cutter. The term becomes more common in the sixteenth century; for example, a diamond with facets from 1538 appears in the accounts of Francis I of France (Laborde 1872, 129; Laborde 1880, 247; Rey 1992, 1:772). I am not aware of the use of the term *facet*, however spelled, in English before the early seventeenth century, when it was used by Malynes, as noted above. Mary Queen of Scots' son, James I of England, purchased "a diamond cut in fassets and set in a collet" in 1626 (Devon 1836, 351). Two of the cuts mentioned by Cellini, the point and the table, became the main Renaissance forms and are discussed here. The more elaborate multifaceted cuts will be covered in the next chapter.

The Point Cut Point cuts, the simplest of cut modifications to an octahedral diamond crystal, were known in the early 1400s and continued to be produced into the sixteenth and seventeenth centuries. 132 • Renaissance Table and Point Cuts

We can probably assume that by the sixteenth century most of these, as well as the table cuts, were being cut on rotating diamond mills rather than the older flat tables. A good representation of a point cut is seen in another of the jewels illustrated in the 1552 *Jewel Book* of the Duchess Anna of Bavaria, now in the Bavarian State Library. As can be seen in figure 7.2, the reflections in the pointed diamond at the top are perfectly depicted, but could easily be mistaken for further facets. Herbert Tillan

Figure 7.2. Detail of a pendant from the *Jewel Book* of the Duchess Anna of Bavaria, 1552/1555, showing a large point- cut diamond. Credit: Bayerische Staatsbibliothek München, Cod.icon. 429, fol. 42r.

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der explained how the reflections seen in an octahedral or modified octahedral diamond depend on its proportions; however, his drawings of these reflections vary slightly from the reflection patterns produced when using computerized ray-tracing software, and this might be explained by his use of glass models in his experiments that have a different refractive index to diamond (Tillander 1995, 23, 25, 27). The large diamond that Cellini described set in a cope clasp for Pope Clement VII around 1530 was also a point cut, assuming that the drawing of it attributed to Francesco Bartoli around 1700 is accurate (figure 7.3). This diamond was, Cellini tells us, supposedly the second largest in the world. The drawing is claimed to have been made actual size, making the diamond some 1.5 centimeters square, thus around fifty to sixty carats. It cost the Pope 38,000 Roman scudi— the equivalent of about 120 kilos of gold then. We can probably assume that the majority of traditional square pyramid- shaped diamonds of significant size from the later fourteenth century onward were point cuts rather than natural octahedra, but this was not true in every case. Georgius Agricola explained, "When a diamond has a natural six- pointed form, and this is the most highly prized, it is set in a ring in such a fashion that a sharp point projects from the setting" (Agricola 1955, 118). Surviving older, uncut diamond crystals might well have been reused. An inventory of 1531 includes eight diamond- set buttons; in four of these, the diamonds are described as "points cut in faces" (*taillées en face*), while two are described simply as "points" (Hackenbroch 1979, 400). This might represent a distinction between point cuts and natural octahedral points. The diamond ring worn by Elihu Yale, East India Company governor in Madras, as seen in his portraits by James Worsdale around 1718, if brought by him from India, may have been a fine natural octahedron (Scarisbrick and Zucker 2014, 134 • Renaissance Table and Point Cuts 86–87). A century later, when Thomas Motte, an official with the East India Company, left India, the Rajah presented him with "a rough diamond set in a ring" (Motte 1800, 83). In the fifteenth century, we also find a range of point- cut diamonds set on

their sides to create a rosette or mosaic-like pattern. Herbert Tillander discussed this style of setting in some detail (Tillander 1995, 88–89). A simple square version Figure 7.3. A pectoral of gold made for Pope Clement VII by Benvenuto Cellini, ca. 1530. Drawing attributed to Francesco Bartoli, ca. 1690–1730. Credit: The British Museum, 1893,0411.10.2. © The Trustees of the British Museum. All rights reserved. Renaissance Table and Point Cuts • 135

is what Tillander calls a “four-petalled rosette,” which he says was in use by 1411 (Tillander 1995, 88). An example of such an arrangement with four point-cut diamonds can be seen in the fifteenth-century enameled gold ring shown in figure 7.4. This is probably from England. Here the exposed edges have been flattened to form narrow “tables.” A drawing of this four-petal rosette is shown in figure 7.5 along with that of a five-petal version based on Tillander’s reproduction of the diamonds in the bridal crown of Princess Margaret of 1468 (Tillander 1995, 90: fig. 149). A pair of clasps with five-petal rosettes are worn by Saint Catherine in a painting of the Virgin and Child by Gerard David, of about 1510, in the National Gallery London (NG1432), and the type probably equates with the “flower of diamond of five pieces” included in an inventory of Charles the Bold, Duke of Burgundy, dating to the late 1460s (Laborde 1851b, 116). There are also more complex versions with six or more diamonds, like a German pendant of around 1500 with a hexagonal arrangement of twelve diamonds that is now in the Green vault, Dresden (Campbell 2009, 18). Point cuts largely fell out of favor by the close of the sixteenth century, and in the 1650s Thomas Nicols, the Cambridge author of a comprehensive book on gems, noted that although point-cut diamonds were sometimes still produced, they were considered less valuable than table cuts (Nicols 1652, 52–53).

Table Cut The characteristics of the table cut include a flat upper surface—the “table”—typically square or rectangular, bounded by flat, sloping side facets. The lower portion of a table cut, the pavilion, could come to a point or to a flat surface, typically smaller than the upper table, called the culet, from the French for bottom. An old English term for culet was trap, and in the 1680s Randle 136 • Renaissance Table and Point Cuts

Figure 7.4. (left) Gold ring set with four point cuts arranged sideways in a square, fifteenth century. Credit: Courtesy of Benjamin Zucker. Holme, a herald under King Charles II, explained, “The Traps, are the square cuts at the bottom of the Stone, from whence the contrary lusters and sparks do proceed” (Holme 1688, 21). The table cut was also often called a “thick stone,” in French *epaisse*, to distinguish it from “thin” (French *foible*) diamonds that had the same upper part as a table cut but a flat back. Many Indian-cut stones were of this latter form and can be seen in abundance in Mughal Indian jewelry. The simplest table cut was, as we have seen, an octahedron or point cut with its top point replaced by a flat horizontal facet. Cellini referred to a large diamond that “had been cut to a point; but since it did not yield the purity of luster which one expects in such a diamond, its owners had ‘cropped’ the point, and, in truth, it was not exactly fit for either point or table cutting” (Symonds 1889, 393–94). John Addington Symonds, the translator, notes that the word he rendered as “cropped” was *ischericato*, “which was properly applied to an unfrocked or de-

Figure 7.5. (above) Diagram of the arrangement of the four diamonds in the ring in figure 7.4 and a “rosette” of five table-cut diamonds. Drawing: Jack Ogden. Renaissance Table and Point Cuts • 137

graded ecclesiastic.” Indeed, Giuseppe Baretta provides justification for this in his 1787 *Dizionario delle lingue italiana ed inglese*, noting the use of *pianta schericato*, meaning a “lopped plant.” It is possible that the word still had the undercurrent of degradation, which would fit with Cellini’s view of the stone. It sounds as if the gem started as a point cut, but then had a bit polished off the top, perhaps to remove a flaw. This destroyed its pointedness, but did not sufficiently flatten it to make a true table. It ended up neither one thing nor the other. Tillander dates the earliest

known use of the expression “table” in the context of a diamond shape to 1431 (Tillander 1995, 100). He doesn’t provide a reference, but the following decade Philip the Good, Duke of Burgundy from 1419 to 1467, paid a Parisian merchant for a collar set with diamonds, some “tables,” some “escuçons,” and a Brussels merchant for a ring with a table diamond (Dehaisnes 1881, B1992). The table cut became ubiquitous in the sixteenth and early seventeenth centuries, largely ousting the point cut. A 1511 portrait of Pope Julius II by Raphael shows what appears to be a large table- cut diamond worn on the third finger of his right hand, and if so it is an early representation of the cut (figure 7.6). A 1530 inventory includes both “une table de dyamant” and “une table de diamant carrée,” while from 1532, there is a mention of a beautiful table diamond “quasi quarrée” (Finot 1885, 37). As we have seen, the old French term carrée, or carré, literally “square,” was usually used as a general term for “facetted,” but here possibly shape was meant. The use of the term was by no means straightforward. In 1669 Tavernier sold a large group of diamonds to Louis XIV of France. Those he described as carrée include what we would term a table diamond, of square shape, a similar one of rectangular shape, and one that is clearly a large flat- bottomed, multifaceted pear shape (Bapst 1889, 403–5). Table cuts were one of Cellini’s three styles of diamond cuts, 138 • Renaissance Table and Point Cuts

Figure 7.6. Detail of a portrait of Pope Julius II by Raphael, 1511. Credit: National Portrait Gallery, London, NG 27. Photo: Francis Cui. and there appear to be four on the clasp made by Cellini for Pope Clement VII (see figure 7.3). The southern European hat badge in figure 7.7 of about 1525–75 is set with a range of diamond shapes, but mostly fairly regular, thin table cuts. About the time this was made, the Spanish artist and goldsmith Juan de Arfe y Villafañe described the table cut as “the perfect diamond” (de Arfe 1572, 41–42). At the start of the seventeenth century, de Boodt described various diamond cuts of which “the most noble” was the table, and in the 1650s Nicols explained that diamonds were most commonly cut into what he termed “a tablet” with “one plain upper table and four latterall tables, two of which are wont to be longer than the others” (Boodt 1609, 69; Nicols 1652, 52–53). The table cut was the most common cut for the smaller diamonds that added sparkle to a wide range of seventeenth-century Renaissance Table and Point Cuts • 139

Figure 7.7. Hat ornament in enameled gold set with variously shaped diamonds, German, ca. 1550. The British Museum, WB.171. Credit: © The Trustees of the British Museum. All rights reserved. jewelry. The large hoard of jewelry found during building work in Cheapside, London, in 1912, known as the Cheapside Hoard, was concealed sometime around 1640 (Forsyth 2013). This treasure provides many examples of small table diamonds (figure 7.8), and one particularly fine larger one (figure 7.9). Another particularly fine table- cut diamond set in a seventeenth- century ring is shown from above in figure 7.10. Comparing the three- dimensional computerized models of the table cuts as described in the past by three writers on diamonds—Juan de Arfe y Villafañe (Spanish, 1535–1603), Anselmus Boëtius de Boodt (Flemish, 1550–1632), and David Jeffries (English, fl. 1750)—it is interesting to note that although far shallower than David Jeffries’s “perfect table” or de Boodt’s “correctly proportioned” table cut, computer ray- tracing reveals 140 • Renaissance Table and Point Cuts that de Arfe’s rather shallow stone still provides a good play of color (de Arfe 1572, 42). These three different versions of a table cut, plus a drawing of that in figure 7.10, are shown in figure 7.11. The shallowness of the de Arfe cut would have meant almost a 60 percent reduction in weight if cut from a regular octahedron. Even Jeffries’s proportions in the mid- eighteenth century would lead to a reduction in weight of about 50 percent if the maximum weight of the stone was cut from a regularly shaped octahedron. This underlines the fact that the form of the rough stone, or of an

Indian-cut stone to be reworked, would significantly affect the shape of the final cut stone. We can see a wide variation in the heights of table-cut diamonds set in the same object. The early seventeenth-century manuscript written by William Heth, *The Goulden Arte, or The Jewell House of Gemes*, describes the ideal proportions of a table-cut diamond, stating that “it must be without any fault both in the corners and sydes Figure 7.8. (left) Table-cut diamonds in an ornament in the Cheapside Hoard from London, first half of seventeenth century. Credit: Copyright Museum of London, A14096. Photo: Jack Ogden. Figure 7.9. (top) Gold and enamel ring set with a large table-cut diamond from the Cheapside Hoard, first half of seventeenth century. Credit: Copyright Museum of London, A14244. Photo: Jack Ogden. Figure 7.10. (bottom) Detail of a table-cut diamond in a gold ring, seventeenth century. Credit: From the Al Thani Collection, inv. 215. Photo: Jack Ogden. Renaissance Table and Point Cuts • 141

Figure 7.11. Proportions of table-cut diamonds. Credit: After (from left to right) David Jeffries, Anselmus de Boodt, and Juan de Arfe y Villafañe, and, on the right, the diamond in figure 7.10. 3D images: Jack Ogden. and everyone of the 4 corners must be sharpe and cleane cutt” (Heth 1603, 65). The reality, of course, was that table cuts were by no means always of perfect rectilinear or square outline. This is reflected in contemporary descriptions, such as the “beautiful and very large table diamond, clear, more long than wide and a little narrower by one of the bezel corners” described in a 1536 inventory (Finot 1885, 63). Maximum weight could be retained if the girdle edges of the stone were left rough and this irregularity could be disguised by careful setting. The uneven edges of gold settings in sixteenth- and seventeenth-century jewelry are not due to shortcomings on behalf of the goldsmith; they were an artifice to keep the faces of the gold settings and the sloping sides of the irregularly shaped diamonds in line and regular (as in figure 7.10). A 1541 inventory describes a large square table diamond as having one corner covered with more gold than another and two others where one or more of the corners were not “in perfection” (Finot 1885, 107). This characteristic of many

142 • Renaissance Table and Point Cuts Renaissance diamonds and their settings was understood and skillfully replicated in some nineteenth-century copies. Despite Jeffries’s mid-eighteenth-century mention of the “perfect table,” the style had been losing favor since the later seventeenth century and many table cuts were being recut as the more fashionable brilliants, and thinner tables as roses. The table cut’s reign was over. In 1823 the British mineralogist John Mawe said, “The table diamond is the least beautiful except the lasques [irregular Indian cuts],” and some fifty years later the London jeweler Harry Emanuel noted that the table cut was “occasionally seen on diamonds dismounted from old ornament’s and stones coming from India” (Mawe 1823, 81; Emanuel 1867, 75). Tillander described and drew the large diamond in the Cheapside Hoard in figure 7.9 as what he called a “scissor cut,” but my examination of this object indicated that it is a basic table cut (Tillander 1995, 122: fig. 217). Tillander said the “scissor cut” dates back to at least 1550 on the basis of a large number set in the heraldic crowned eagle of Anne of Austria dating from about then, although he refers to these as “scissor cut Hogbacks (some of them flat-bottomed)” (Tillander 1995, 122). The diamond in the ring in figure 7.12 might be an example. This ring, dated to the late sixteenth century, is said to have been found at Chelmsford, England, and was in the Hashimoto Collection in Japan, gifted to the National Museum of Western Art in Tokyo in 2012 (Scarlsbrick 2004, 66 cat. 154; Suwa and Coxon 2010, 84). The back of the diamond is cut like that of a traditional table cut, tapering to a rectangular culet, clearly visible through the stone. This ring with its modification of the table form to increase sparkle represents the changing fashions of the time and is witness to the sort of experimentation that eventually led

to the brilliant cut. Renaissance Table and Point Cuts • 143 “Sparks” “Sparks” is an old term for small diamonds frequently encountered in descriptions of jewelry from the mid- sixteenth until the later eighteenth centuries. Indeed, “a spark” is defined as a small diamond in many eighteenth-century dictionaries. Early uses of the term include “a flower of gold garnished with sparks of diamonds” presented to Queen Elizabeth I in the late 1570s, although another gift around the same time was a “dolphyn of mother of perle, garnished with small sparks of rubies and opall,” which shows that the term could also be applied to other gems (Way 1862, 145–58; Nichols 1823, 70). Eighteenth-century usage of the term seems to have been widespread. As far as the earlier mentions of sparks are concerned, they might best be equated with the small table-cut diamonds that occur in large numbers in sixteenth- and seventeenth-century jewelry. By the later seventeenth century, however, the term probably came to include little rose cuts. A small ring in the Victoria and Albert Museum, London, and probably of seventeenth-century date is of gold set with a small rose-cut diamond (inv. 90 8- 1871). The inside of the hoop is engraved “This spark will grow,” no doubt alluding to the hoped-for love of the recipient for the giver. It also seems that in some cases “sparks” referred to small uncut diamonds (“natural sparks”), or to pieces removed from a larger diamond in cutting (Anson 1745, 48; Keyssler 1760, 23).

Setting of Table- and Point-Cut Diamonds To obtain the best “sparkle” from a table- or point-cut diamond, the gem had to be set with a shiny foil behind it or, more usually, over a black substance, typically some type of carbon black mixed with resin. Where diamonds are now missing in jewelry, this black bedding substance is often visible, frequently retaining the imprint of the back of the stone. Examples of this include the necklace from the Cheapside Hoard shown in figure 7.8. There is an ambiguous comment in a seventh-century Indian text translated as saying that “foul lampblack does not so much as touch the diamond mirror, naturally brilliant with a radiance of ever glittering splendor, so sorrow touches not the illustrious,” but it might be optimistic to see this as having relevance here (Cowell and Thomas 1897, 184). An early European mention of a black backing is in the mid- sixteenth century by Biringuccio, who said, “If the skin of its [diamond’s] earthiness is cleaned with art and then it is given its polish, it becomes very brilliant when a lustrous black color is placed underneath” (Smith and Gnudi 1990, 122). For this purpose, Cellini recommended a mixture of soot from a lamp (using oil that was “old, sweet and clear”) with mastic resin (Ashbee 1967, 35–40). He observed, “It

Figure 7.12. Ring with an elaboration of a table-cut diamond, late sixteenth century. Credit: National Museum of Western Art, Tokyo, formerly Hashimoto Collection. Photo: Jun Nakamura.

Renaissance Table and Point Cuts • 145 is an extraordinary thing that the diamond, which is the most limpid and brilliant of all earthly stones, gains a thousand-fold in beauty when you, as it were, soil it with a black tint.” He also added that if blue indigo was used instead of soot behind yellowish diamonds, they looked green and “most gracious to the eye.” Using blue pigment to “improve” the color of a diamond is a subterfuge still sometimes encountered and which had a particular flurry of popularity following the development of waterproof blue aniline dyes in the mid- nineteenth century. The Goulden Arte or the Jewel House of Gems, written in the first decade of the seventeenth century, described the use of candle soot and mastic as a backing for diamonds (Heth 1603). According to Thomas Nicols a few decades later, “The tincture, foyle, or colour for a true Diamond” was “pure mastick and a small quantitie of ivory, burnt black, and finely powdered” (Nicols 1652, 46–47; see also Houghton 1727, 72). A manuscript in the British Library with the heading Trades: Secrets & Receipts Mechanical, dating from around the same time as Nicols, similarly noted the use of mastic and burnt ivory, but

adds that the addition of a little spike oil (obtained from lavender) would increase its strength (BL Ms. Add. 78339, fol. 258). From at least the early seventeenth century, the term *tent* was applied to this black bedding material, as witnessed by its use in *The Goulden Arte*, where it is explained that a diamond “mustn’t be too thick or too thin or won’t take its *tent*” (Heth 1603, 65r). An early definition is from Thomas Blount’s 1661 *Glossographia*, where “*tent*” is the substance “they put under Table Diamonds when they set them in work, and is made of Mastick and Turpentine” (Blount 1661, s.v. “*tent*”). Turpentine, or clear gum, was also described as a less advisable alternative to mastic (Fryer 1698, 214; Hooke and Derham 1726, 215). Interestingly, de Boodt commented that a real diamond adhered more strongly to the black mastic backing than fakes, a useful test for a true stone (Boodt 1609, 57).

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As an alternative to the black resin or gum mixture, it was said that “black Velvet is good, under a thin Table- Diamond, scraped as you do Lint” (Fryer 1698, 214). The same author also suggested scraped blackened ivory under a thin table, and Cellini provided yet another alternative— blackened glass (Fryer 1698, 214; Ashbee 1967, 40). A 1644 comment that “His Excellency, Diamond- like, the darker he is set, shines the brighter” is a nice allusion to this practice of setting diamonds over a black backing (Mercurius Britannicus: Communicating the Affairs of Great Britain, 29 July 1644). A little later is William Secker’s “Human misery is to Divine Mercy, as a black foil is to a sparkling diamond” (Secker 1707, 2).

The history of what we would term the foiling of diamonds—that is, setting them over a thin, polished, metal foil—is hard to disentangle since, as we have just seen, the term *foil* was applied sometimes also to the black “*tent*” (Nicols 1652, 46–47; Fryer 1698, 214). It is unclear which meaning Cellini uses when he tells us that in sixteenth-century Italy, foiling was forbidden for all gems except diamonds (Ashbee 1967, 25). I am not aware of any sixteenth- or seventeenth-century European jewelry with diamonds set over a metal foil, although it is common for other gems. In the later seventeenth century, the genealogist and writer Randle Holme (1627–1700) noted the names of the various components of a gold jewelry setting. These included the foil he described as “a certain colored Tin foil set under the Stone in the Collet, to give it a color answerable to it self” (Holme 1688, 21). However, this presumably applied to colored gems only. Things were different in India, where in Mughal jewelry thin diamonds were often set over thin and typically high-purity gold foil. However, the most reflective metallic foils for diamonds are of silver or, perhaps in many cases, tin, and these can be seen in some later Mughal Indian jewelry. I haven’t seen Renaissance Table and Point Cuts

• 147a description of how Indian jewelers produced such perfect foils, but in the late eighteenth century the English traveler and writer William Eton recorded the “Valuable Secret” of the foils used behind diamonds and other precious stones as employed by the Armenian jewelers in Istanbul (Eton 1798, 225–26). Thin tin “the thickness of strong brown paper, scraped very bright,” was placed over a depression cut in lead of the size of the eventual setting, and the foil pressed into this using a mallet and a polished agate punch. It was then cut to shape and highly polished. The result was a beautiful foil “scarcely to be imagined by those who have never seen it.” Even though of cheap tin, such foils were noted as being expensive. By the mid-sixteenth century in Europe, some diamonds were also being set with an open back—*à jour* in French. An example is a diamond described as “*à jour*, cut as a triangle without foil” in a 1556 inventory of the jewelry received by the Queen of Scotland from James Hamilton, Duke of Châtellerauld (Thomson 1815, 117–18). From 1542 we have diamonds belonging to James Hamilton’s second cousin, King James V of Scotland, described as “set on day light,” a literal translation of *à jour* (Thomson 1815, 60). The 1594 will of Lady Anne Dacre includes the bequest

of “one diamond pointed without a foil” (East Sussex Record Office—DAN/1126/fols. 122r–127r). This may also have meant open-backed. In general, however, diamonds set open-backed were only common after the later seventeenth century. This setting style was particularly suited to the brilliant-cut stones then coming into vogue. In the later seventeenth century, Randle Holme defined the other parts of a setting relevant to diamonds:

- The Collet is the Socket in which the Stone is set.
- The Scallops, or Muscles of the Collet, are the works on the side of it, like those shells.
- Renaissance Table and Point Cuts
- The Graining of the Collet, are little heads of Gold or enammel set at the Foot of the Scallops.
- The Bessel, is the top of the Collet, which being beaten to the Stone, holds it in.
- The Cressants, are the half rounds which the Bessel is cut into.

The terms collet and bezel are still used in the same way today; the other terms applied to the typical parts of a Renaissance ring. The type of setting described by Holme was already out of date by the time he wrote about them, but it is a reminder that Renaissance gem setting is one of the high points of jewelry history. The opening up of the European sea trade with Asia and the newly discovered Americas heralded a glittering age of gems, with diamonds from India playing a major role. Diamond cutters, with improving skills and expanding clientele, experimented with diverse shapes, but the simple table and point cuts provided a unity of form, sparkled effectively, and made optimum use of the raw material. More facets, however, could make a diamond even more spectacular, and the rose diamond appeared—soon to become ubiquitous. Renaissance Table and Point Cuts

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The second half of the fifteenth century had ushered in a new era of diamond cutting. Improved diamond-cutting technology, increased trade with the East, and the ascendancy of wealthy European courts had combined to create a heady period of experimentation and rivalry. Diamond cutters were the new alchemists, converting diamond rough into glittering jewels. Sparkle required an angular geometry, a series of flat faces—facets—to reflect and refract light. The point cut and the table cut, considered in the previous chapter, were in the vanguard of this new fashion, but there was a limit to their sparkle. To really reflect and refract Renaissance Multifaceted Cuts light, and to show off the “fire” of a diamond, a greater number of facets were needed. The Rose Cut

The final shape of a diamond and the number of its facets were influenced by the size and shape of the raw material, and considerations of weight retention coupled with the aesthetic desire for symmetry. When the starting point was a cleavage fragment of diamond, the flat cleavage surface could form a flat base to the stone, and was sometimes left unpolished, particularly with the smaller stones. The upper part could be formed into a faceted dome. This form of stone is what we can loosely define as a rose cut. This echoes the English lexicographer Nathan Bailey’s succinct definition in the early eighteenth century when See figure 8.7. 151he explained that a rose diamond “is one that is quite flat underneath; but whose upper part is cut in divers little faces, usually triangles, the uppermost of which terminates in a point” (Bailey et al. 1730, s.v. “diamond”). Final form also reflected the practical limitations imposed by the accuracy and sophistication of the mechanism necessary to position and hold the diamond against the cutting wheel, and the experience of the cutter. There might be anything between six and many dozens of facets on a rose, typically all triangular, and Herbert Tillander has illustrated numerous varieties of these, noting that they “were so common during the fifteenth and sixteenth centuries that it is impossible to reproduce here more than a selection of the most typical designs” (Tillander 1995, 49). There are also rose diamonds with trapezoidal facets, including some of what Tillander classifies as “flat-bottomed pointed star cuts” and “V-cut” roses, and some with square facets (Tillander 1995, 38). If, at the risk of what Herbert Tillander considered “oversimplification,” we

define a rose cut as did Bailey, one of the earliest could be the precisely faceted diamond set in the Burgundian Court Goblet now in the Kunsthistorisches Museum in Vienna, assuming its base is flat (see figure 6.5; figure 8.1). This magnificent rock-crystal vessel with gem-set gold mounts was made for Philip the Good in the 1460s. There is a 1534 description of a gold ring set with a large and beautiful diamond cut with sixteen varied facets (Finot 1885, 48). It was, we are told, elongated, rounded above, flat below, rising in the middle to a point—by the sound of it, another early rose cut. A pear-shaped rose might be meant by the term *fer de lance* or “spear-head,” which we encounter in sixteenth-century French inventories. There were two set in a large cross originally made for Francis I of France (ruled 1515–1547) and later owned by his son, Henri II of France (1519–1559), and then Henri II’s daughter-in-law Mary Queen of Scots (Bapst 1889, 152 • Renaissance Multifaceted Cuts Figure 8.1. Three-dimensional reconstruction and drawing of the pear-shaped diamond in the Burgundian Court Goblet (as in figure 6.5). Credit: Based on a drawing by Herbert Tillander (1995, fig. 349). 3D image: Jack Ogden. 44, 98). Based on contemporary representations of this piece in portraits, its appearance has been reconstructed by the French jeweler and historian Germain Bapst in 1889, and the gem specialists Hubert Bari and Violaine Sautter in 2001 (Bapst 1889, 98; Bari and Sautter 2001, 253). Although these reconstructions show the stones faceted and rising to points, they differ in how they depict the number and arrangement of facets. This underlines the difficulties in identifying cuts from old descriptions or even illustrations. A prime example of the problems of judging diamond shapes by old descriptions dates from around 1530 when the celebrated Italian goldsmith Benvenuto Cellini set “a diamond the facets of which were cut starwise to a point” in a cope clasp for Pope Clement VII. To modern ears, this certainly sounds like rose cut, and has sometimes been interpreted as such. However, the drawing of the clasp attributed to Francesco Bartoli around 1700 and now in the British Museum clearly shows it as a point cut (figure 7.3). The surviving side view shows that the clasp did have enough depth to accommodate a full octahedral point cut. Cellini says he set the stone “free,” held by four claws. That this didn’t mean open-backed or *à jour*, as some have suggested, is demonstrated by the back Renaissance Multifaceted Cuts • 153 view, also preserved in the British Museum. Being a rose cut, or open backed, or both, would not have agreed with Cellini’s comment that other jewelers thought it would have been better if he had tinted “the whole base of the stone and the back facets” (Ashbee 1967, 29–30). A further problem with descriptions of “roses” and their early chronology is the difficulty of deciding whether the descriptive “rose” applies to the cut of a diamond or a rosette-like arrangement of several diamonds. The same is true in French, where the equivalent of the English “rose diamond” is *rosette à diamant*. So, sadly, it is difficult to find unambiguous descriptions of rose-cut diamonds in the sixteenth century. It is tempting to see mention of a rose cut in a French inventory of 1536 that included three settings of gold, of which two contained triangular table diamonds and the third a *rosette de diamant* (Gay 1887, 209). Less certain are the “twelve roses of diamonds and twelve ruby ballases [spinels] set in gold enameled in white, blue and black” that were among royal jewels in Edinburgh Castle in 1579 (Thomson 1815, 293). Gerard Malynes’s list of diamond forms at the end of the 1500s included “Roses, Harts, Columes, Demy Crosses, or other fashions of Poly Angles” (Malynes 1622, 74–75). This must surely mean that rose was an identifiable class of cut. Certainly the section on gems in *The Goulden Arte*, or *The Jewell House of Gemes* compiled by William Heth at the start of the seventeenth century talks about rose diamonds that are undoubtedly rose-cut stones, and in terms that suggest that such stones were then familiar (Heth 1603). In the nineteenth century, the London jeweler and

author Edwin Streeter noted that it “was not until the year 1520 that the Rose- cut was introduced, while the form of the Brilliant was not known until the reign of Louis XIII of France” (Streeter 1877, 32). Streeter seems to have derived this information from the German- born American mineralogist Louis Feuchtwanger, who some forty years earlier said, in remarkably similar phrasing, that “in 1520, they made use of the Rhomb cut; and the form of brilliants was invented in the reign of Louis XII” (Feuchtwanger 1838, 51). Streeter presumably took Feuchtwanger’s “rhomb” to mean “rose” and corrected Louis XII (later fifteenth century) to a more sensible Louis XIII (early seventeenth) for the introduction of the brilliant. It is not clear what Feuchtwanger meant by “rhomb cut” since it is not an expression he uses elsewhere, but he distinguished it from both table and brilliant cuts, so multifaceted cutting and thus the rose is likely. “Rhomb” need not be taken too literally. Terms for facet shapes have not always followed a high level of geometrical exactitude. In the mid- eighteenth century, the diamond expert David Jeffries described the triangular facets on a rose cut as “lozenges,” another word for rhomb, and a term for facet that had been used as early as the fourteenth century. An early description of a rose- cut diamond specifically named as such can be found in 1611, when King James I of England purchased a “fair rose diamond set in a ring” from the London goldsmith John Harris (Devon 1836, 147). The earliest known mention of rose diamonds in Antwerp is dated to 1615 (Antwerp 1993, 45). William Prynne’s 1645 diatribe against papacy quotes two documents of 1623 that list gifts of jewels and which distinguish between “pointed diamonds,” “table diamonds,” “rose diamonds,” and “faucet [facet] diamonds” (Prynne 1645, 52–54). Facet diamonds and rose diamonds are similarly distinguished in the 1691 inventory of the French crown jewels (Bapst 1889, 390). However, seventeenth- century terminology could be ambiguous. Randle Holme, a herald on whom King Charles II bestowed the remarkable- sounding title “sewer of the chamber of the extraordinary,” equated a faceted stone with a rose when he said: “The Fosset [facet] stone or Rose stone, is Renaissance Multifaceted Cuts • 155 cut into many squares ending in the Center” (Holme 1688, 21). Here he uses “square,” like the French carré, to mean faceted without specific shape implications. Seventeenth- century designs for jewelry are a major source of information about diamond cuts, but again, not all is straightforward. In some cases, rose diamonds seem to be depicted, such as in the drawing of an earring that belonged to King Philip III of Spain’s daughter, Anne of Austria (1601–1666) (figure 8.2). This drawing is one of several designs in a sketchbook of the jeweler Paul Maréchal, illustrated by Germain Bapst (Bapst 1889, 331–33). Maréchal worked for several of the French royal jewelers. In this drawing, the diamonds are shown as fairly symmetrical, twenty- four- facet rose cuts. However, Figure 8.2. Drawing of an earring belonging to Anne of Austria (1601–1666). From the sketchbook of Paul Maréchal (after Bapst 1889). 156 • Renaissance Multifaceted Cuts the rose diamonds in some other seventeenth- century jewelry designs are seemingly artistic impressions rather than accurate facet diagrams. An example shown in figure 8.3 is a design by the French jeweler Gilles Légaré (1610–1685), who came from a family of French goldsmiths and was a court jeweler under King Louis XIV (Evans 1917). A book of his influential designs was published in Paris in 1663 (Légaré 1663). The square facet formation in the diamonds shown here is in a pattern of a type that Herbert Tillander conjectured was deliberately based on a Pythagorean mathematical progression (Tillander 1995, 42). In practice, I believe that the pattern shown is impossible to cut as a series of flat faces on a convex surface. Légaré seemingly shows the backs of some of the stones as faceted, thus implying open- backed settings, unless here his cross- hatching is just shading. The Twenty- Four- Facet Rose The seventeenth century saw the

rise to prominence of the twenty- four- facet rose that is generally accepted as the epitome of fine antique rose- cut diamonds (figure 8.4). When David Jeffries published the first edition of his book on diamonds in 1750, he greatly extolled the virtues of rose diamonds, explaining and illustrating the shape and proportions of the idealized twenty- four- facet form. This form of rose diamond had appeared by the end of the sixteenth century, and Herbert Tillander cites the “Fellowship Pendant” in the Grünes Gewölbe in Dresden, probably of the late sixteenth century, as the earliest jewel he was aware of that was set with these full, twenty- four- facet rose diamonds (Tillander 1995, 54). The rose diamonds in jewelry in the Cheapside Hoard, deposited around 1640, are mostly small and fairly irregular (figure 8.5), but there are a few well- shaped, twenty- four- facet roses. The pendant ornament in figure 8.6, probably of a generation or so later, is noteworthy because it is set with colored diamonds. Here the seven large stones are full twenty- four- facet roses and fairly regular. The numerous smaller diamonds in the same object are far more irregular in shape and symmetry, a quality of small diamond often seen in later seventeenth- and eighteenth- century jewelry. The Figure 8.3. A jewel containing rose diamonds designed by Gilles Légaré (1610–1685). From Légaré (1663). *Renaissance Multifaceted Cuts* • 157

Figure 8.4. (above left) A twenty- four- facet “standard” rose- cut diamond. 3D image: Jack Ogden. Figure 8.5. (above right) Rose diamond in a pin from the Cheapside Hoard, first half of the seventeenth century. Credit: Copyright Museum of London, A14164. Copyright Museum of London. Photo: Jack Ogden. Figure 8.6. (right) Diamond pendant set with various colors of rose- cut diamonds. Credit: Courtesy of Benjamin Zucker. 158 • *Renaissance Multifaceted Cuts*

lower edges of little rose diamonds of this type were often left as rough, bruted surfaces. This reduced labor, retained weight, and, perhaps fortuitously, provided a roughness that aided retention in the settings. The same applies to some of the larger roses. The magnificent order of the Great George in figure 8.7 was made for Charles II in 1661. This with its collar (not shown here), forming the Garter Collar and Great George, was described as “set with 20 large diamonds and a one hundred and odd lesser diamonds.” The larger stones here are roses. The Order of the Garter was the highest order of chivalry. In 1668 the same king invested his namesake King Charles XI of Sweden with an even grander “Order of the Garter.” When Charles Howard, first Earl of Carlisle, took delivery of this from the Jewel House at the Tower of London prior to delivering it, the receipt he signed meticulously noted all the diamonds in it—a total of 321 “roses,” fifty- two of which were described as large (Ashmole 1672, appendix). In the Great George pendant in figure 8.7, the settings for the diamonds are in gold, but soon silver settings came into vogue, the sparkle of the roses and other multifaceted cuts being best set off by white metal. It might be assumed that a rose diamond with a flat polished base would look dark and unsightly when mounted in the traditional Renaissance way over a black bedding material. However, experiments reveal that well- cut roses can indeed look their best when placed over a black backing. The increasing popularity of rose cuts is mirrored by their more frequent mention in diamond- cutting apprentice contracts in Antwerp in the second half of the seventeenth century (de Bie 2014, 284). In her recent study of the Antwerp rose, Annelies de Bie, a historian at the University of Antwerp, compares the statutes of the 1582 Antwerp Guild Ordinances, where the masterpiece required from an apprentice consisted of a thick table, a thin table, and a faceted stone, with a 1672 ordinance by which the diamond- cutting apprentices still had to cut a thick and thin table, but the third stone was now described as an “à la mode rose” (de Bie 2014, 284). This is equated with the full twenty- four- facet rose (Kockelbergh, Walgrave, and Vleeschdrager 1992, 58). Since the apprentices only learned to cut an

Figure 8.7. Great George made for Charles II,

1661. It is set with rose diamonds and a few smaller table cuts. Credit: Royal Collection, RCIN 441924. Royal Collection Trust/© Her Majesty Queen Elizabeth II 2016.

Renaissance Multifaceted Cuts • 159 Antwerp rose toward the end of their apprenticeship, the rose cut was clearly viewed as more demanding than a table cut (de Bie 2014, 285). Other Rose Cuts Not all seventeenth- and eighteenth- century roses had twenty- four facets. The ring in figures 8.8 and 8.9 dating from around 1610 is in black enameled gold set with a high and beautifully polished rose diamond, but here with just twelve facets, Tillander called this form a “Crowned or Twelve- facet rose” (Tillander 1995, 53; Scarisbrick 2007, 312–13). As this fine ring shows, quality of cutting did not then necessarily correlate to facet numbers, but such a distinction has been made. By the mid- eighteenth century, Antwerp had become associated with a poorer class of rose- cut diamonds. A rose- cut diamond could be categorized as either an Antwerp (or Brabant) rose or a Dutch (or Holland) rose. The distinction according to most published definitions is that the Dutch rose was of twenty- four facets, the Antwerp fewer—six, eight, or twelve—although according to the German mineralogist Max Bauer, the distinguishing feature was that the Antwerp roses were shallower; the number of facets could be the same (Bauer 1968, 1:78). Other definitions, dating back to the 1870s, say that if a rose has twelve or fewer facets it is called an Antwerp Rose, if it has eighteen or twenty it is called a “Demi- Holland,” and if twenty- four a “Holland Rose” (Castellani 1871, 88). In the 1867 second edition of his book *Diamonds*, the London jeweler Harry Emanuel says: “The rose diamond is frequently cut with many less facets, particularly those called Antwerp roses, but these are much less brilliant, and are only used for the commoner kind of work” (Emanuel 1867, 76–77). In his first edition in 1865, Emanuel had made no mention

160 • Renaissance Multifaceted Cuts of Antwerp roses and thus provides no indication that cheaper cutting was associated with the town (Emanuel 1865). Nevertheless, in 1735 John Barrow, an English historian and mathematician, published diamond prices in his *Dictionarium Polygraphicum*, separated into separate tables, one for “Dutch cut” and one for “Antwerp cut.” Weight for weight the Antwerp ones were significantly cheaper (Barrow 1735, n.p.). For example, a two- carat “Dutch- cut” stone was priced at between £42 and £45, an Antwerp- cut one between just £24 and £26. These price tables were headed “Diamonds cut facet or table- wise,” the former presumably including rose cuts. Barrow’s assertion that rose cuts were always one- third cheaper than table diamonds because the latter looked bigger for their weight when set is strange since the contrary is true.

Jaquelado Cut Another early term that may have included rose cuts is *jaquelado*, a Spanish word meaning “checkerboard.” A 1525 inventory

Figure 8.8. (above left) Gold ring set with twelve- facet rose diamond, ca. 1610. Credit: Courtesy of Benjamin Zucker. **Figure 8.9. (above right)** Detail of the rose diamond in figure 8.8. Credit: Courtesy of Benjamin Zucker.

Renaissance Multifaceted Cuts • 161 tory of Catherine of Austria, wife of King John III of Portugal, includes a jewel set with a spinel, a diamond *jaquelado*, and three baroque pearls (Cremades 2010, 3:3058). When the Holy Roman Emperor Charles V’s Genoese admiral, Andrea Doria (1466–1560), went to Genoa following the death of his cousin Giannettino Doria in 1547, he gave the widow a *jaquelado* diamond in the shape of a heart (pear shape) (Porreño and Sueyro 1666, 247). Philip II of Spain (reigned 1556–1598) had several diamonds described as *jaquelado* and a large topaz in the same style (*jaquelado a modo de diamante*) (Cantón 1959, 231 and passim). “Topaz” here was almost certainly a yellow sapphire, known as “oriental topaz” into recent times. There are several examples of colored gems cut this way in the Cheapside Hoard of circa 1640, including some remarkably precisely faceted sapphires. I have tentatively proposed a Portuguese origin for this checkerboard lapidary style, and such an origin

would perhaps explain the widespread use of a Spanish term for it (Ogden 2013, 362). Of course, not all jaquelado stones were necessarily flat bottomed, but nor have been all the diamonds described as roses. There is an interesting statement in a nineteenth-century Spanish-German dictionary that jaquelado was a term applied to diamonds cut in the East Indies (Tolhausen 1889, 163). The original authority behind this statement is unknown, but it would make sense if applied to the multifaceted style of diamond cutting encountered with some larger Indian-cut diamonds, sometimes referred to as “Mughal cut.” The origins of this so-called Mughal cut will be considered in the chapter on cutting in India, but the form is just a multifaceted or “rose” cutting style as applied to larger stones. A famous example is the so-called Great Mughal Diamond, which was in the Mughal Emperor Aurangzeb’s treasury and supposedly shown to the 162 • Renaissance Multifaceted Cuts

Figure 8.10. An Indian-cut diamond briolette from Noël-Antoine Pluche’s 1748 *Le Spectacle de la Nature*. 3D image: Jack Ogden. French gem merchant and traveler Jean-Baptiste Tavernier in 1665. Tavernier described this as “a round rose, very high at one side,” like half an egg, as shown in his drawing, although this appears oversimplified and might well have been drawn from memory, if he saw it at all (Ball 1889, 1:315–17, 2:97; Malecka 2016). The best-known surviving diamond of this form is the Orlov Diamond, now set in the Imperial Scepter preserved at the Diamond Fund of the Moscow Kremlin (Balfour 2009, 209–14). The use of the term “rose” for the multifaceted Mughal cut continued into recent times. The Koh-i-Nur, when it first arrived in England and prior to recutting, was often described in the newspapers as a rose cut. Briolette One version of a multifaceted cut is the briolette, which Harry Emanuel described as like two roses base to base and “a very beautiful form, particularly for pendeloques; but these stones are rarely met with” (Emanuel 1867, 77). Two Indian-cut pendeloques were sold by Tavernier to King Louis XIV of France. In his *Le Spectacle de la Nature* in the mid-1700s, Noël-Antoine Pluche, a French priest renowned for this multivolume work on natural history, illustrated a pear-shaped diamond cut in Renaissance Multifaceted Cuts • 163

the Indian style (“taille à l’Indienne”), based on that shown by Tavernier, a form he described as an Indian pear or pendaloque (Pluche 1748, 349–52). His drawing is shown in figure 8.10. Demise of the Rose Cut The introduction of the brilliant cut during the seventeenth century, which will be looked at in the next chapter, ousted the table cut and eventually the rose cut. In 1813 the British mineralogist and former sea captain John Mawe explained that “of late many rose-cut stones from Holland have been recut into brilliants, notwithstanding the additional expense and the loss of size necessarily attendant on this operation” (Mawe 1813, 60). This practice had been denounced by London jeweler David Jeffries. For him, “Rose Diamonds when truly manufactured are not inferior to Brilliants, all circumstances considered.” We might detect his anxiety about explaining things to his own clients in his complaint that if roses fell in favor due to any perceived “superior excellency” of brilliants, it would be “to the great prejudice of the most noble and ancient families, who are greatly possessed of them [roses] as being a more ancient jewel than Brilliants.” But Jeffries was fighting a losing battle. Even a generation before his book, the 14 March 1724 issue of the northern English newspaper *Newcastle Courant* commented, “The Price of Diamond is very considerably chang’d here of late. Brilliants having been raised to above Forty per Cent, more than they sold for before. At the same Time Rose Diamonds are Twenty per Cent cheaper than they were Six Months ago, which is occasioned by the large Demands for the former.” There was a slight recurrence in the popularity of roses in the nineteenth century, and Harry Emanuel said that although rose diamonds had been unfashionable for a long time, they were now back in vogue because they gave a good show for 164 • Renaissance

Multifaceted Cuts the money (Emanuel 1867, 77). One reason for the demise of rose diamonds was that they did not suit the open-backed settings that became increasingly popular in the eighteenth century and were ubiquitous by the nineteenth. There was also the simple fact that brilliants looked better than roses. An anonymous writer in the *Devizes and Wiltshire Gazette* on 24 January 1828 commented that the rose-cut diamond “wants the beauty possessed by the brilliant, and has not the same play of color,” an observation made by others as the century progressed. That great master of diamond cutting Marcel Tolkowski, famous for the development of the modern brilliant cut, said much the same a century later: “This is the fundamental reason of the unpopularity of the rose: there is no fire” (quoted in Tillander 1995, 212). The multifaceted rose diamond brought true sparkle to diamonds and in the 1600s was the most prevalent cut in European jewelry. However, it was usurped by the brilliant cut, a form with far greater “fire,” which first appeared in about the 1660s. Unlike the rose, the brilliant has a faceted lower part, and so in its wake came open-back settings and the dawn of a new age of jewelry styles. Today, three hundred and fifty years after its introduction, the brilliant cut is still the most popular of forms.

Renaissance Multifaceted Cuts

- In 1651 and 1652 the English naturalist Thomas Nicols described diamond as a gem “which doth sparkle forth its glorie much like the twinkling of a glorious star” (Nicols 1652, 46). This use of the word sparkle sums up the change that had revolutionized the diamond trade over the preceding century. Diamonds were now meant to sparkle, and this meant cutting a facet arrangement to maximize this. In Nicols’s day, the rose cut was the epitome of the sparkling diamond, but it was soon to be superseded by the brilliant cut, still the most popular diamond cut today. The brilliant cut is characterized by a flat upper table, typically octagonal, bordered by small facets reaching down to the widest part of the Early Brilliant Cut part—the girdle. This upper part is called the crown. Below the girdle, the facets taper down to either a point or a small, flat facet called a culet. This lower part is termed the pavilion. The brilliant form developed from the table cut by the addition of extra facets, just as the table cut could be produced by truncating a point cut (figure 9.1). As Antoine-François de Fourcroy explained in 1796: “Those diamonds [brilliants] which are cut into facets all over their circumference [that is, top and bottom], have a much superior luster to those which are cut only on one side. On this account, lapidaries give the first the name of brilliant, while they call the others roses” (Fourcroy 1796, 2:182). A typical modern, round brilliant-cut diamond will have fifty-seven or fifty-eight facets—the table, thirty-two crown facets, twenty-four pavilion facets, and, sometimes, a small culet. This is the same number and distribution that David Jeffries illustrated in 1751 (figure 9.2). The Regent Diamond (figure 9.3) is a See figure 9.7. 167

Figure 9.1. Cutting of an octahedral diamond into a point cut, then a table cut, and then a simple brilliant. Drawing: Jack Ogden. 168

- The Early Brilliant Cut fine early brilliant, the cutting of which will be discussed in the next chapter. Early Brilliant Cuts The brilliant cut appeared soon after the mid-1600s, but its origins are still debated. The word *brillant* was used in French to describe a faceted diamond at least as early as 1671 and was so recorded by the French lexicographer Pierre Richelet in his *Dictionnaire François* in 1680 (Rey 1992, 1:291; Richelet 1680, 95). Various people, in various places, have been credited with the invention of the brilliant cut. The inspiration may even have come from a diamond cut by a European in India that had reached the French court in 1669, as we will see in the chapter on diamond cutting in India. France in the time of Louis XIV is a likely center for the introduction of the brilliant cut. Its rise in popularity has often been attributed to Cardinal Jules Mazarin (1602–1661), first minister to the French king and an avid collector of diamonds. The so-called Mazarin diamonds, which the cardinal bequeathed to the king, are listed in the 1691

inventory of the French crown jewels. Here, the majority are described as table cut, including the famed Grand Mazarin, but two (the seventeenth and eighteenth Mazarin stones) are described as brilliants. However, it is not impossible that these Mazarin brilliants had been recut by 1691—as the historian Germain Bapst Figure 9.2. (left) A page from David Jeffries’s *A treatise on diamonds and pearls* (2nd edition, 1751) showing the cutting of a brilliant diamond, and drawings of cushion, round, oval, and pear- shaped brilliant diamonds from front and back. The thick horizontal lines represent the height of the stones. Credit: Royal Collection, RCIN 1092000. Royal Collection Trust/© Her Majesty Queen Elizabeth II 2016. Figure 9.3. (below) The Pitt, or Regent, Diamond. Credit: Paris, Musée du Louvre, MV1017. remarked, Louis XIV, XV, and XVI continually had diamonds cut and recut (Bapst 1889, 340). It is perhaps not impossible that Mazarin himself was unacquainted with the brilliant cut. What is today the famous Hope Diamond, on display in the National Gem and Mineral collection at the National Museum The Early Brilliant Cut • 169of Natural History in Washington, D.C., was described by Jean- Baptiste Tavernier as cut in the Indian fashion in the form of a heart when he sold it to Louis XIV in 1669 (Bapst 1889, 374n2, 403). Four years later, it was recut by royal diamond cutter Jean Pitan (also sometimes spelled Pittan and Pitau) into a heart- shaped brilliant, the “French Blue” (Ogden 2017). Although recut later into the form familiar to us as the Hope, Pitan’s original form is preserved in a lead cast made of it (Farges et al. 2009). A replica in cubic zirconium using measurements taken from the lead cast, cut by the specialist lapidary Scott Sucher, is shown in figure 9.4. There is also the pink Condé or Grand Condé diamond now in the Musée Condé in Chantilly, France. This is essentially a pear- shaped brilliant of just over nine carats given to Louis II, Prince of Condé, by French king Louis XIII, probably in 1643, but it seems likely that it was cut into its present form sometime after that (Balfour 2009, 61). The invention of the brilliant cut has also been attributed to an Italian, Vincenzo Peruggi or Peruzzi. This attribution was seemingly first voiced by Antoine Caire, a French lapidary, in 1826. He noted that with regard to the invention of the brilliant, “The information I have been able to obtain seems to give the glory to Vincent Peruzzi of Venice who lived in the late seventeenth century” (Caire 1826, 58; my translation from his French). Since then many have quoted Caire with regard to Peruzzi, including Harry Emanuel, Augusto Castellani, and Edwin Streeter, the latter in one case calling him Vincenzo Bruzzi (Emanuel 1867, 66; Castellani 1871, 86–87; Streeter 1877, 25). More recently, when researching his book on the history of diamond cutting, the late Herbert Tillander could find no evidence for the existence of a Venetian diamond cutter called Peruggi or Peruzzi and considered him to be a myth. However, considering Caire’s lapidary and gemological experience, and the fact that he learned his lapidary craft as an apprentice in Turin, Italy, there may be something to his story. Tillander noted that he was planning to write “the full story of Caire’s erroneous theory on the evolution of the Brilliant cut,” but unfortunately this does not seem to have been completed (Tillander 1995, 4). The Brilliant Cut in London and the Low Countries We can probably date the introduction of the brilliant cut to around 1660–70, and probably to France, but the brilliant cut soon also became closely associated with cutting in London. The London Grub Street Journal on 12 February 1736 quoted The Post Boy newspaper in recording the death the previous The Early Brilliant Cut • 171day of “Mr. Sam Sheafe, a diamond cutter who first brought perfection to the brilliants, etc.” Sadly, I have been unable to unearth either that issue of The Post Boy or any further details about Sheafe, who in any case can hardly have been a role model for Jean Pitan in 1673

Paris, let alone Cardinal Mazarin a decade earlier. Perhaps Samuel Sheafe won't join Vincenzo Peruzzi or Jules Mazarin in vying for recognition as the original inventor of the brilliant cut, but it is a reminder that in the late seventeenth and early eighteenth centuries London was a major diamond-cutting center, and as Harry Emanuel later recorded: "In England there used to be several cutters who were renowned for the excellence and perfection of their work and whose diamonds still called old English fetch a much larger price than any others" (Emanuel 1865, 66). The Scottish scientist Sir David Brewster even went so far as to state that "the brilliant form was invented in England" (Brewster 1832, 575n). Rare praise from a Scot. In any case, English cutters were experts in producing brilliant-cut diamonds by the early 1700s. A datable example is the Regent Diamond, previously known as the Pitt Diamond (see figure 9.3). The cutting of this large stone in London in 1706 is described in the next chapter. The Regent was bought by the French regent Philippe II, Duke of Orléans, in 1717 and mounted in the coronation crown of Louis XV in 1722. The crown was later dismantled, but it can be seen in a detailed engraving by Sébastien Antoine (figure 9.5). The Regent is lower center; the Sancy is at the very top, and the lozenge-shaped diamonds that form the tops of the fleurs-de-lys are eight of the Mazarin diamonds. The diamond set in a hair ornament (figure 9.6) may well be a slightly earlier example of a surviving brilliant cut. The piece in its present form has been adapted from a ring bezel and may even originally have been a button, but the underside of the set

172 • The Early Brilliant Cut Figure 9.5. An engraving of the 1722 coronation crown of Louis XV of France, by Sébastien Antoine. The large diamond at lower center is the Regent. The stone at the top is the Sancy. Credit: After Bapst (1884). The diamond bears an engraved inscription saying that it was a gift from King Charles II to Nell Gwyn in 1680 (Haidar and Sardar 2015, 328–29). The former owners of this ornament were the Dukes of St. Albans, which supports the story of its origin because the first Duke of St. Albans was an illegitimate son of King Charles II by his mistress Nell Gwyn (Scarisbrick 1990, 42–43). The center brilliant has been called a transitional cut between table and brilliant because of its simple pavilion facets, but the pavilion seems fairly typical for an early square brilliant (Antwerp 1993, 198–99, no. 90). The jeweler and antiquary Mozes Heiman Gans quotes a Dutch archive of 1688 that included a jewelry set with a variety of diamonds described as brilliants, including a bracelet with The Early Brilliant Cut

173 Figure 9.6. Diamond-set hairpin, converted from a ring. The inscription says the large early brilliant-cut diamond was given by Charles II to his mistress Nell Gwyn. Credit: Courtesy of Benjamin Zucker. 174 • The Early Brilliant Cut thirteen large brilliant diamonds ("groote brilliant diamanten"). Since other diamonds in this list are described as rose, facet, and table, it seems likely that the brilliants were indeed such (Gans 1961, 425). Another inventory in Dutch, a few years later than the one just quoted, includes many brilliant diamonds, but here the jewelry belonged to Mary II, wife of William III of England, so cutting in England is quite likely (Gans 1961, 428–30). It is to be hoped that future study of Dutch and Belgian archives will throw more light on brilliant cutting there. The Cutting of a Brilliant With its square form, the center diamond of the Nell Gwyn bodkin seems to be remarkably close to the brilliant cut described in detail by David Jeffries in 1750. He explains that the initial stage of cutting a brilliant diamond from an octahedral crystal was to re-proportion the octahedron by polishing down its vertical height—point to point—until it was equal to its width. This gives an apex angle of ninety degrees, the same as seen with point cuts as early as the fifteenth century. The vertical height was then measured and the top cut down by $\frac{5}{18}$ of the height, to provide the table, and the bottom ground down by $\frac{1}{18}$ of the height to provide the culet. Once this was done, the diamond was "a complete square table diamond" (see figure 9.1). The additional top (crown) and bottom

(pavilion) facets were then added. If the angles and proportions described by Jeffries were used, then, according to John Mawe, “the collet will play in the center of every facet” (Mawe 1823, 78–79). Indeed, the gemologist Wilhelm Friedrich Eppler has shown that the relatively large culet as described by Jeffries actually “reflects many rays which otherwise would have been lost for the brilliancy of the stone” (Eppler 1967). Typical, rather high, small- tabled early brilliants can be seen in the enameled gold ring in figure 9.7. This has an illustrious history, particularly relevant here. It was presented by Frederick, Prince of Wales, to the French jeweler and traveler John Chardin in 1736. John Chardin was familiar with Persia and India, and knew Jean-Baptiste Tavernier. As early as 1750, David Jeffries illustrated round, oval, and pear- shaped brilliant- cut diamonds as well as the then standard square or cushion- shaped brilliants (see figure 9.2). These brilliants are the true forerunners of the twentieth- century brilliant; indeed, proportions changed little from the early eighteenth to later nineteenth centuries. Variants Proportion preferences varied from place to place, as they still do to some extent. Mawe explained that many brilliant diamonds cut outside of England had a crown facet angle of fifty degrees or more, rather than the English forty- five degrees, The Early Brilliant Cut • 175

Figure 9.7. (right) Enameled gold ring set with brilliant- cut diamonds, presented to the French jeweler and traveler John Chardin by Frederick, Prince of Wales, in 1736. Credit: Royal Collection, RCIN 9020. Royal Collection Trust/© Her Majesty Queen Elizabeth II 2016. Figure 9.8. (opposite, top) Two simplified versions of the brilliant cut: the “star” (left) and “single cut” (right). 3D image: Jack Ogden. Figure 9.9. (opposite, bottom) A demi- brilliant. 3D image: Jack Ogden. 176 • The Early Brilliant Cut in order to preserve weight. These could be recut in England, with the increase in value compensating for loss in weight and the cost of labor. Impression of size was important to some, however, and Mawe complained, “Such stress is laid by modern fashion on the superficial extent of a brilliant, that the old rules for proportioning its dimensions are now nearly obsolete: the diamond cutters have almost discarded the use of measures, and in forming the facets, trust wholly to the eye” (Mawe 1823, 80, 68–69). There were also diamonds cut as simplified versions of the brilliant. Perhaps the most common of these simpler cuts was the star cut (figure 9.8, left column). This cut certainly dates back to the early 1700s and was illustrated in the monumental French *Encyclopédie; ou Dictionnaire raisonné des sciences, des arts et des métiers* (Diderot et al. 1771, pl. 2: 30–32). This cut was described by Harry Emanuel in 1867 as “the old English single- cut, also called star single cut” (Emanuel 1867, 75). There was also what Emanuel called the “single cut brilliant” that had a square table flanked by sixteen facets (figure 9.8, right column), also shown in the *Encyclopédie* (Diderot et al. 1771, pl. 2: 27–29; Emanuel 1867, 75). Emanuel says, “This is the old form of cutting.” A version of the brilliant—the demi- brilliant or half- brilliant—is sometimes encountered in older inventories. For example, several are listed in the 1691 inventory of the French royal jewels (Bapst 1889, 381–83). The French priest Noël Antoine Pluche described and illustrated the side view of what he labels “le demi brillant,” also called brillonet, in his monumental encyclopedia of natural history (figure 9.9; Pluche 1748, 349–52). There is also a top and side view of such a stone in the plate of diamond cuts in the mid- eighteenth- century *Encyclopédie; ou Dictionnaire raisonné des sciences, des arts et des métiers* (Diderot et al. 1771, pl. 2: 9–10). I am unaware of ever seeing such a “demi- brillant” in jewelry, and it can hardly have been attractive set either over a black bedding or, after the late seventeenth century, in an open setting. Extremely thin brilliants, with all- but- flat pavilions are, however, seen in nineteenth- century Indian jewelry where thin Indian “lasks” have been recut into brilliants. These typically have crowns far thicker than their pavilions, which can be almost flat.

Despite their thinness, these diamonds can look remarkably bright. Later variations of the brilliant include the so-called Lisbon cut, which has a more complex crown than a traditional brilliant cut, but this was presumably at the earliest a mid-eighteenth-century innovation in the wake of the influx of Brazilian diamonds into Lisbon after 1725 (Carvalho 2014). The earliest representation of the Lisbon cut I have found is in 1850 by Charles Holtzapffel in the lapidary section of his monumental six-volume *Turning and Mechanical Manipulation* (Holtzapffel 1850, 1332–33 and figs. 1166–68).

The Early Brilliant Cut • 177 Setting Brilliants Although some brilliants were set with closed backs, the brilliant was best suited to the open-backed settings that came into widespread use from the later seventeenth century onward. An early reference to a diamond set à jour is seen in a 1663 commission by Louis XIV for a cross with the diamonds set in this manner (Bapst 1889, 354). Even then, open backs were not a new phenomenon with diamonds. Roman diamond rings are almost all set with open backs, open sides, or both. It might be significant that the various early diamond rings that originated further east, in Afghanistan or Pakistan, are not set in this way.

Recutting Sixteenth-century table cuts, especially the frequent examples with chipped corners, would have been ideal as raw material for recutting into brilliants. In an ideal case, cutting one of Jeffries's proportioned table cuts into a brilliant reduces the overall weight by only about 5 percent. By the early eighteenth century, jewelers were routinely recutting the older table-cut diamonds into brilliants, when proportions allowed. A surviving invoice from the London jeweler Louis Fury covers just such recutting (figure 9.10). The entry for 18 November 1720 shown here includes: "By Cutting of 61 thick tables unto brilliants." The thirty largest weighed a total of almost fifteen carats—thus averaging just under two carats a stone. These cost £1 (20 shillings) per carat to recut. The remaining thirty-one, presumably far smaller, cost just 1s 6p (£0.075) apiece to recut. A further thirty-one diamonds cost the same to recut, as did the cutting of eighteen "thin tables" into roses. Roses, if deep, could also be recut as brilliants, with a relatively high loss in weight. As a result, roses were valued at less per carat than brilliants.

178 • The Early Brilliant Cut Since the seventeenth century there have been variations and improvements to the brilliant. These have been well covered in numerous publications—in particular, American diamond specialist Al Gilbertson's recent study of the American brilliant cut (Gilbertson 2007). Marcel Tolkowsky's improved design for the facet angles of a brilliant changed cutting forever in 1919, and the introduction of mechanized sawing perhaps helped the development of new cuts such as the baguette and its trapezoidal and other relatives (Tolkowsky 1919). It must be remembered that when you strip away the romance of diamonds, and their glittering brilliance, however, the manual cutting of smaller stones is repetitive work. J. H. Browne described the realities of diamond cutting in Amsterdam in the 1870s: "Diamond-cutting seems to me a most dismal trade. The hundreds of men I have seen engaged in the mills appeared wan and worn and melancholy, as well they might, with their perpetual and monotonous round of cheerless and consuming toil. To them each day is like every other day. The seasons and the years come and go, and go and go and go." (Browne 1872, 351). In the 1880s Arthur Scott and Lewis Atkinson noted the wages for diamond cutting in London: women and girls for rose cutting 25–35s per week, cutters 35–75s per week, cleavers 50–130s per week, and polishers 40–120s per week. This was for a twelve-hour day (Scott and Atkinson 1888, 21). It is noteworthy that

cleavers received the most. Modern technology has led to more precise regularity, sizes, proportions, and brilliance. Computer programs plan how best to cut stones; the proportions of the final stone are graded by other computer programs. In these days of consistency and “ideal cuts,” there are those who believe that the older, less regular stones possess a beauty and individuality that modern production fails to match. This is not new. An unknown correspondent in the *London Review* a century and a half ago, describing his impressions on seeing the Koh-i-Nur displayed at the 1862 Great Exhibition, had no doubts. The Koh-i-Nur had been recut from its ancient Indian form ten years earlier and now was “no more the luminous mound which delighted the eyes of the Moguls.” It “shows a huge face of diamond, but in order to attain this vulgar attribute of size or ‘spread,’ it has been cut so thin, that it is not a brilliant in the true sense of the word: it is a thin slab of diamond with facettes cut on it in imitation of those of a brilliant” (Anon 1862). Although we can probably place the date of the introduction of the brilliant cut to within a decade or two after 1650, the name and even nationality of its inventor are so far unknown. The faceted back and front of the brilliant provided great sparkle and fire, and it is not surprising that it soon eclipsed the once-popular rose. The brilliant cut developed at the very time that the English and Dutch trading companies were bringing an increasing number of diamonds back from India. England’s major part in this trade, and its acceptance of immigrant Jewish diamond dealers, also established London as a major diamond-cutting center—an often overlooked role that will be considered in the next chapter. London is seldom thought of today as playing a major role in diamond cutting. In the past, things were different. Diamonds had been entering Britain, and being set in royal jewels, at least since the mid-1200s, but there is little evidence for cutting there until the later 1500s, when cutting was encouraged even by Queen Elizabeth. Diamonds began to flow into England in greater abundance following the establishment of the East India Company in 1600, and within a couple of generations London had become a major cutting center.

10 Diamond Cutting in London The earliest mention of commerce involving unset diamonds we hear of in England is a Roche diamond (uncut diamond) for which, along with other gems and jewelry, two Genoese merchants requested an import license into England in 1491 (Rymer 1727, 12: 460). The document describes the stone as an “amigdalat diamont,” presumably because its shape resembled an almond (Latin *amygdalus*). In 1536 Sir John Gostwick, Henry VIII’s treasurer, paid “Andrew Thomas, merchant of Venice,” £1,520 on the king’s behalf for a diamond. This was an enormous sum of money in those days, but the diamond was probably already cut (Gairdner 1888, 151). Some such diamonds came north overland across Europe, others with the galleys that plied to Antwerp from Venice (Brown 1864, cxli). The Venetian Bartolommeo di Pasi produced a comprehensive catalogue of the objects being traded to and from Venice around Detail of a portrait of King James I of England painted by John de Critz in 1604. The diamond hanging from the hat jewel is the Sancy. Credit: National Galleries of Scotland, PG 561.

1831500. Diamonds are mentioned only three times among the amazing variety of goods traded between cities all around the Mediterranean and up into northern Europe, and only as goods traded from Venice. An export of diamonds to London is not mentioned, but “pointed diamonds” went to Paris (*diamanti in punta*), “some pointed diamonds” went to Lisbon, and various gems “and also diamonds” went to Antwerp (Di Pasi 1521, 192v, 202r). Lenzen interpreted this to mean that point-cut diamonds went to Paris and Lisbon, while rough diamonds went to Antwerp to be cut there (Lenzen 1970, 61). This interpretation is not impossible, but he could well be reading too much into a minor variation in wording. We might assume that the import of rough diamonds into England in the late fifteenth century implies that diamonds were already being cut

there. Indeed, we have an English jeweler's bill or pricing estimate, probably dating "to the beginning of Henry VIII's reign or earlier," thus no later than around 1520, for a ruby and diamond brooch; the estimate included the polishing of the four diamonds (Gairdner et al. 1929, 1, 15). It is possible that such stones may have needed to be sent abroad for polishing, however; when a box of diamonds was stolen in Portsmouth in 1523 or early 1524, it was found that they had been offered for sale in London "but, as no man here could polish and dress them, none would buy" (Gairdner et al. 1929, 147). These diamonds were taken to Bruges instead. They had been on a Dutch ship sailing between Lisbon and Antwerp that sank near Chichester and were stolen by a "beer brewer" in Portsmouth from the master of the ship who had lodged with him. This is an early reference to the trade in diamonds from Lisbon to Antwerp, where many Portuguese merchants had settled, a trade link that became preeminent toward the end of the century (Everaert 2004, 469–71).

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Diamond Cutting in Portugal and Antwerp With the rise of Lisbon as a diamond center, Venice and Genoa waned. De Pasi's mention of diamonds sent from Venice to Lisbon shows that the city was a market for diamonds prior to, or independent of, the direct sea route to India that had been opened up by his time. Whether there was diamond cutting in Lisbon that early is uncertain, but it was certainly established soon. Baltazar Cornejo was a diamond expert and cutter with the Casa da India, the Lisbon authority that handled the East Indies trade in the 1530s (Silva 1993, 22). About this same time Jörg Herwart from Augsburg represented the Fugger banking company in Lisbon and had diamond- cutting workshops there, illustrating the strong commercial links between Lisbon and northern Europe (Correia 2011). Later in the sixteenth century, Philip Holbein, the grandson of the German artist Hans Holbein, was described as a diamond cutter and royal jeweler "from Lisbon" (Thieme- Becker 1907– , s.v. "Holbein, Philipp I"). Interestingly, he is reported to have used a water- powered diamond- cutting wheel (Stetten 1779, 144). A letter written in 1570 from an unnamed Antwerp merchant and diamond cutter to a fellow Antwerp craftsman explains that the writer had traveled to Lisbon and was staying there with a diamond cutter called Hans, presumably a compatriot (Butler 1903). He reported that Hans was now running only one of his two diamond cutting mills, and of the twenty- six or twenty- seven mills in the city, only twelve were kept going. He adds: "Had I known there was no more work I should not have come hitherwards. . . . At Antwerp there is more work than here." This suggests that diamond cutting was fairly widespread in Lisbon up to the mid- sixteenth century or so, but then dwindled there, with Antwerp in the ascendance. There certainly was a major market in the north.

In late 1587, Diamond Cutting in London • 185 news arrived in London from Antwerp that Alexander Farnese, Duke of Parma, the governor of the Spanish Netherlands and a highly accomplished military leader, was "making great preparations for war." To ensure he looked his best for the campaign, "the embroiders and diamond cutters [in Antwerp] work night and day" (Lomas and Hinds 1927, 394).

Earliest Cutting in London By the late 1500s, diamond cutting was well established in London and rough diamonds were being brought there by Portuguese merchants. For example, the jeweler Hannibal Gammon purchased a parcel of "brutt diamonds," that is, rough diamonds, from one in 1584 (Gammon 1606, 70r). Not all reached the London diamond cutters through official channels. The English were renowned as pirates—or privateers, depending on point of view. In 1592 English sailors, including Sir Walter Raleigh, intercepted the Portuguese ship *Madre de Deus* on its way back from the East Indies. The ship, carrying perhaps the largest single treasure of gems ever taken, was brought back to the port of Dartmouth. Jewelers, merchants, and crooks flooded to Dartmouth, and most of the treasure was rapidly dispersed. One witness tells of seeing

about 1,800 diamonds from the treasure with just one man, a Mr. Broadbent in Gravesend, when it was inquired of him whether there might be a better market for the stones in Frankfurt or Venice (Giuseppi 1892, 254). One of those who rushed to obtain jewels from the Madre de Deus, despite warnings against doing so, was the London jeweler Hannibal Gammon (Giuseppi 1892, 255). A large rough diamond from this treasure, valued at £2,600, ended up with a Dutch diamond cutter who worked in a room on the second story of Hannibal Gammon's house at "The Horseshoe in Cheap" in London (Salisbury 1895, 182).

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Gammon's contemporary, the merchant and government adviser Gerard Malynes, may have played a part in establishing London as a cutting center. Of English descent, Malynes was born in Antwerp and came to England in 1561. He was involved in the jewelry business, and in the 1620s he wrote about the value and assessment of diamonds, saying, "It is almost 40 yeares since I did maintaine divers milnes [mills] and cutters of Diamonds," implying that he was so involved in the 1580s (Malynes 1622, 75). This might tie in with a commission from Queen Elizabeth in June 1587 to her jeweler John Spilman "to take up diamond cutters, ruby cutters, agate cutters, and other workmen at her Majesty's prices" (Lemon 1865, 418). The diamond polishers who immigrated to London in the late sixteenth century were mainly Protestants from the Netherlands and France (Goose and Luu 2006; Hofmeester 2013, 38–39). The fall of Antwerp into Spanish hands in 1585 led to an exodus of Jews that is traditionally tied in with the rise of Amsterdam as a diamond-cutting center. Edgar Samuel has pointed out, however, that although Jews were well represented among Amsterdam jewelers in the seventeenth century, they were "in a minority among the diamond cutters and polishers" (Samuel 1978–80). The same seems to have been true of London. The London-based Jewish diamond trading networks, following the Resettlement of Jews in England in the 1650s, have been studied in detail by Edgar Samuel and Gedalia Yogevev (Samuel 1978–80, 2003; Yogevev 1978).

Cutting of Royal Diamonds A 1596 account (figure 10.1) concerning the costs involved with two diamonds offered to Queen Elizabeth I throws considerable light on a major diamond transaction involving cutting in London at the close of the sixteenth century (Salisbury 1915, Diamond Cutting in London • 187).

Figure 10.1. A 1596 account concerning the costs involved with two diamonds offered to Queen Elizabeth I. Credit: From the Cecil papers at Hatfield House. Reproduced by permission of the Marquess of Salisbury, Hatfield House.

188 • Diamond Cutting in London 588–89). The account itemizes the cost of the rough diamonds, foreign travel, and payment to the cutter with board and lodging for him and his men for at least a year. The board—that is, the low-quality diamond crushed to make abrasive to cut the two diamonds—cost £150, almost the same as the labor of cutting. In addition, there was the cost of cutting models of the final diamonds in "crystal" (presumably rock crystal) that were used to show the queen what the finished diamonds would look like, and the cost of setting those models in gold to show the queen the final effect. And lastly there was the price for setting the diamonds, plus interest on it all. The account notes that the owners had received higher offers in Frankfurt and from both the French ambassador and Sir Anthony Ashley, then clerk of the Privy Council, but preferred to see the diamonds in the queen's hands. The mention of travel abroad and the need to pay for the cutter's board and lodging suggests that the cutter and his associates were from overseas, presumably the Low Countries, brought to London to carry out the work. The reference to cutting models of the proposed final form of the diamonds in crystal and then setting these in gold is noteworthy. For those in the trade, lead models were sufficient to provide an idea of size and form, as Fryer explained, but when trying to tempt a potential purchaser of an important stone, a fine model in crystal was advisable (Fryer 1698, 213–14). The same year that the diamond

models were made for Elizabeth I, in France, Nicolas de Harlay, Seigneur de Sancy, sent a similar crystal model of the diamond that bears his name to the sultan in Constantinople hoping he might buy it. It was noted that the diamond itself could not be sent unless paid for (Brown et al. 1897, 215). This attempt at a sale of this fifty- four- carat stone failed, but eventually, in 1604, the diamond was sold to King James I of England (1603–25), Elizabeth I's successor, who was also King James VI of Scotland from 1567 to 1625 (Balfour 2009, 247). Among the Cecil papers at Hatfield House, the house built in 1611 by Robert Cecil, first Earl of Salisbury and chief minister to King James I, and still the home of the Cecil family, is a receipt noting that the Sancy Diamond had been received from M. de Beaumont, ambassador from the king of France, for the king of England, James I, on 10 March 1605. It gives the weight as fifty- three carats and explains how the price of 60,000 crowns would be paid in three installments— a third immediately, a third on 24 April, and the rest the following year in March (Giuseppi 1938, 91–92). The Sancy was one of the earliest diamonds cut in a sophisticated way, perhaps as early as the later fifteenth century, and may even be a reincarnation of the Balle de Flandres. James's large diamond was added as a pendant to the "Mirror of Great Britain" jewel that the next year was described in the inventory of the jewels in the Tower of London: "A greate and ryche jewell of golde, called the Myrror of Great Brytaine, conteyninge one verye fayre table dyamonde, one verye fayre table rubye, twoe other lardge dyamondes cutt lozengewise, the one of them called the Stone of the letter H of Scotlande, garnished with small dyamondes, twoe rounde perles fixed, and one fayre dyamonde cutt in fawcettis, bought of Sauncey" (Palgrave 1836, 2:305). The jewel in this form, with the Sancy already hanging below, is shown in a portrait of King James painted by John de Critz in 1604 soon after the purchase of the diamond (figure 10.2). A drawing by the Dutch jeweler Thomas Cletcher (1598–1668), son- in- law of Antwerp jeweler Jacob Ghijsberti, survives showing the "Mirror of Great Britain" with a slightly different configuration with a second table diamond instead of the ruby, but similarly with the Sancy hanging below it. The design is annotated with a note that the piece had been commissioned by King James, who had paid £70,000 for it, and had been worn in his 190 •

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Figure 10.2. Detail of John de Critz's 1604 portrait of King James I of England showing the Sancy diamond hanging from the hat jewel. Credit: National Galleries of Scotland, PG 561. hat. Cletcher's descriptions of the gems in this object—for example, noting that one of the lozenge stones was very flat, and giving weights for all but one where he guesses the weight— show that he was well acquainted with the piece (Gans 1961, 89, upper right). The Sancy was sold in 1657 by James II to Cardinal Mazarin, who in turn bequeathed it to the French king. The Heyday of London Diamond Cutting By the 1660s London had become a world center for the diamond trade. It was noted that £200,000 of rough diamonds were entering England each year and that London was now the main cutting center, no longer Amsterdam or Venice (Grey Diamond Cutting in London • 1911769, 272–89). There is now abundant evidence for diamond cutting in London, and many of the cutters have Dutch or Flemish names. One such was Nicholas Maubert of St. Giles's Cripplegate, London, the subject of legal action in the late 1670s regarding his recovery of a debt and then "speaking contemptuous Words against the Protection of the Lord Chamberlain of His Majesty's Household." One of his defenses was that he was "a foreigner and unacquainted with the laws of England." This, along with his name, shows he was an immigrant, but his lack of acquaintance with the laws of England seems a poor excuse. He was not new to England; some four years earlier, in December 1664, the diamond merchant John Cholmley had written to his brother Nathaniel, recently arrived in India, saying: "I thank you kindly for the Laske [Indian- cut

diamond] you sent me, Nic Maubert cut it and I would have had £12 for it, But a friend got it off me” (Cholmley 1664–93, fol. 0131). Mention of the “Laske” is a reminder that a significant number of the Indian diamonds imported into Europe had been cut in India, but were considered too crude to be used without recutting. Such stones were almost certainly the diamonds without “order or grace” that the seventeenth-century jeweler Robert de Berquen tells us were brought from India and recut.¹ Maubert also jointly invested in diamonds with other London jewelers. For example, the banker/jeweler Sir Francis Child bought rough diamonds in partnership with him and another jeweler. These diamonds were then polished and sold, partly retail and partly into the trade (Samuel 1977). The London-based, Dutch- or Flemish- sounding Jasper Cloek left a 1682 will instructing that his “three [diamond- polishing] Mills in the Garrett and with all and singular the utensils materials and appertenances” should be sold to best advantage (National Archives 1682 Prob. 11/371). Having three mills suggests he had a fair amount of work. The same will also refers to “seventy five 192 • Diamond Cutting in London pounds due from Mr. Chomley Gent” and the payment of anything that be found “Justlie due and owing to Mr. Hendrick van Hoornesbeck [sp?] of Anwerpe Merchant.” This suggests that Jasper Cloek obtained diamonds from one or more Antwerp merchants. We can equate “Mr. Chomley Gent” with John Cholmley or, less likely, his brother Nathaniel, who only returned to London from India in 1682. Nathaniel Cholmley also had an account with a Mr. Foster, a diamond cutter who acted as a broker in some of his transactions (Cholmley 1664–93, fol. 0077). Something of the business arrangements of a diamond cutter at this period can be seen from William Watson’s 1794 *Treatise of the Law of Partnership*, where he uses as an example the case of a 1730s partnership between the diamond cutter Philip Hubert and Robert Nelson, a London diamond merchant (Watson 1794, 37–144). Although of early eighteenth- rather than late seventeenth- century date, the basics were probably little changed. Hubert agreed to cut diamonds for Nelson and to be involved in the buying and selling of the diamonds. He would provide £100 for buying the machinery and £400 toward buying “rough diamonds for their mutual benefit and advantage.” After agreed deductions, “half of the profit and loss was to be divided and sustained” between them. It didn’t go well; Hubert and Nelson went bankrupt in 1739. The same *Treatise of the Law of Partnership* noted that fourteen shillings per carat was to be allowed for the cutting. A century earlier the cost of cutting and polishing a diamond had been twenty shillings a carat (Southey 1819, 892). This reduction in cutting costs might have related to the cheaper boart that became available from Brazil after the early 1730s. “Boart,” diamond too flawed for gem use, was not evenly distributed in nature, as it is broken down by river- born transport. In India, it was not abundant and was relatively expensive—Cholmley *Diamond Cutting in London* • 193 notes a price as high as six or seven shillings a carat in India (Cholmley 1664–93, fol. 0060 and 0076). The cost of the boart needed to cut the two large diamonds for Queen Elizabeth in 1596, as noted above, was high at £150. As we will see later, the diamond dust required just over a century later for the cutting of Thomas Pitt’s large diamond—later the Regent Diamond—cost £1,400. Successful business attracts taxation, and so it was that in 1670 the English Parliament had debated the possibility of imposing a tax on the import of rough diamonds. This tax doesn’t seem to have been imposed, but two decades later, taxes were introduced to help the country fund the war against France. These measures included a “Duty of Twenty Shillings for every Hundred Pounds Value of all Diamonds, Pearls, Rubies, Emeralds, and other Jewels and precious Stones, imported after the Twenty- fifth Day of December 1692” (Raithby 1819, 380–87). That equated to a 1 percent duty on the declared value of the gems, this value being “affirmed by the Oath of the Importer.” Predictably,

we hear soon of a package of diamonds seized at import. They had been entered with a declared value of £500, but were suspected of being worth £10,000 (Redington 1868, 318). Mr. Pitt's Diamond Perhaps the largest diamond cut in London around 1700 was the one that Sir Thomas Pitt, president of Madras, sent back from India with his son Robert in 1702. This diamond was eventually sold to Philip, Duke of Orleans, a nephew of Louis XIV and regent to the young Louis XV, and thenceforth the diamond bore the name "Regent Diamond" (see figure 9.3). It had been offered previously to much of the royalty in Europe, including the British Queen Anne, but rejected as too costly. That no other European royalty could afford it induced the Duke 194 • Diamond Cutting in London of Orleans to buy it as a matter of French honor. A considerable amount is known of this stone—some myth, some fact—ranging from its original discovery, a probably fanciful story of it being smuggled from the mine in a leg wound, and its journey to London and eventual sale. What is relevant here is the copious information regarding its cutting (C. N. Dalton 1915, 270–87; Hedges 1889, cxxv–cxlvii; Lawson 1905, 17–50). Pitt's large diamond is variously recorded as weighing 410 and 426 carats rough. There were surface flaws apparent, but on the basis of a "window" polished on the stone to allow observation of the interior, it seemed clear inside. Robert Pitt wrote to his father in December 1703 to say that the diamond was with the cutter "Mr. Cope." We can note that some writers refer to the cutter as Harris, presumably meaning Jeremiah Harris, a diamond cutter of London whose 1718 will survives (National Archives PROB 11/562), but the surviving Pitt correspondence refers only to Mr. Cope. Perhaps Harris worked with or for Cope. This was the London cutter Joseph Cope of St. Stephen Walbrook, London. Many of his bills of exchange and receipts, some of his correspondence, other business papers, and his will have survived (National Archives Kew, Will PROB 20/597). His business must have been considerable. Edgar Samuel has shown how, between 1698 and 1704, Joseph Cope cut an average of £10,000 worth of diamonds a year for banker and goldsmith Sir Francis Child (Samuel 1977, 51). The records of Child's business also reveal that he bought smaller cut diamonds from Antwerp or Amsterdam because they were cheaper than those cut in London, a price disparity that would eventually contribute to London's decline as a diamond- cutting center. In any case, Cope soon realized that the flaws in Thomas Pitt's diamond actually extended quite deep into the stone, meaning that more had to be cut off to make it usable. The cutting of the diamond was completed in early 1706, having taken Diamond Cutting in London • 195 just over two years. To the dismay of Pitt, the total weight of the final cushion- shaped brilliant (see figure 9.3)—referred to as a "brillion"—was reported to be 140 carats, a third of its original weight. In the cutting process, several pieces were sawn off; these "chips" removed were valued at £8,000. The diamond dust required for the cutting cost £1,400, and the cost of cutting was £5,000—about £12 a carat. These figures were quoted in *Gentleman's Magazine* in 1776 (vol. 46, 105), and there seems no reason to doubt them. Lead models were made of the rough and of the stone during cutting, and these survive in the collection of the Natural History Museum, London (Bari and Sautter 2001, 191). These models were also represented in a watercolor by Dutch- born artist Jan van Rymsdyk in 1772 (figure 10.3), and a version of this illustration was used in Jan and Andreas van Rymsdyk's *Museum Britannicum* of 1778. Below the lead models in figure 10.3 is shown Pitt's diamond as finally cut. The bottom of the figure shows the Florentine yellow diamond. Cope was also asked to "cutt two or three in crystal"—that is, models of the finished gem to show prospective customers. Several models of Pitt's diamond are in old collections, but perhaps most of glass. There was a rock crystal model of the diamond in the collection of the eighteenth- century Scot tish physician and collector William Hunter. This model,

now in the Hunterian Museum of the University of Glasgow, is not inconceivably one of Cope's originals.² Pitt was particularly hoping Queen Anne would buy his diamond "for the honor of me and my posterity," but eventually it was sold to the French regent in 1717 for two million livres, which has been estimated at the equivalent of just over £133,000 then—close to the London jeweler David Jeffries's statement that the diamond sold for £135,000. The price equates with slightly less than £1,000 a carat. From the start, Pitt had been adamant that his stone would be worth £1,500 a carat when 196 • Diamond Cutting in London

Figure 10.3. Lead models made of the Pitt, later Regent, Diamond during cutting. Below are the Regent as finally cut and the Florentine yellow diamond. Watercolor by Dutch-born artist Jan van Rymsdyk, 1772. Credit: The British Museum, 1948, 1118.33. © The Trustees of the British Museum. All rights reserved.

cut; indeed, he said that at that price it was "as cheap as Neck beef"—neck beef being a particularly cheap cut of meat. There is a portrait of Thomas Pitt at Chevening House in Kent, England, painted by the celebrated portraitist Sir Godfrey Kneller (figure 10.4). In the background we see Pitt's hat to which his diamond is attached, and we are told that the oversized heel of his left shoe (not seen in this detail) had a cavity for hiding the stone (Lawson 1905, 49n).³ Repeal of the Duty

The 1692 import duty on gems had had a negative effect on the London diamond-cutting trade, and this was exacerbated by lessening political support for the East India Company. In 1696 Diamond Cutting in London • 197

the English writer on agriculture and trade John Houghton Figure 10.4. Thomas Pitt at Chevening House, in Kent, England, by Sir Godfrey Kneller. His large diamond can be seen on his hat. Credit: By the kind permission of the Board of Trustees of the Chevening Estate. 198 •

Diamond Cutting in London noted that during the reign of Charles II (1630–1685), England had "a mighty Trade for Diamonds from the East-Indies: 'Twas generally talk'd of as the chieftest in Europe." However, since "that Company has been discouraged, this Trade has greatly sank; and by Consequence the Workers [cutters] of them must cease too; the more to our Disrepute" (Houghton 1727, 73–74). Records cannot tell us how often merchants managed to avoid the import duty, but we hear of attempts that failed, such as in 1721 when the English Ipswich Journal reported that merchants trying to smuggle "125 large Diamonds, and two large Emeralds of immense value" into London from Holland had their gems seized (29 April 1721). The duty was undoubtedly an impediment to the cutting trade, but the political will to remove it only came around 1730 when diamonds from India were joined by those the Portuguese brought in increasing numbers from the newly discovered mines in Brazil. It was imperative that London should play a major role in this expanding trade. In 1732 Lord Tyrawley, then envoy to Portugal, addressed the British government on behalf of Portuguese merchants affected by the duties: "When Diamonds were only found in the East Indies, the Settlement which our Country has at Fort St. George [later Madras, now Chennai] had almost brought the whole Diamond Trade into the hands of the English, so that London, within these thirty Years, is become the first Market for them in Europe; and upon that account, the best Diamond Cutters having come over and settled there, it has been for a long time the place where Diamonds, especially Brilliants, are cut in the greatest perfection" (National Archives, Kew, SP 89/37, 2 May 1732; partially quoted in Southey 1819, 892). Lord Tyrawley went on to note the competition: "I am told they cut and polish Diamonds very well in Amsterdam; great quantities, especially of small ones, are cut in Antwerp. In Paris they cut Diamonds very well; there are also Diamond cutters in Venice and Hamburg" (Southey 1819, 892). That same year, "A Petition of Several Merchants of the City of London . . . and other Traders and Dealers in Diamonds" was presented to the House of Commons asking for the duty to be scrapped, as duly noted in Journal of

the House of Commons for 26 February 1732. Lord Tyrawley and the merchants' petition had the desired result, with "An Act for the Free Importation and Exportation of Diamonds, Pearls, Rubies, Emeralds, and all other Jewels, and Precious Stones" passed in March 1732 and taking effect from April 1733.⁴ There was a diamond business in London through the eighteenth century from which many records survive (Samuel 1977, 2003; Yogeve 1978; Vanneste 2011, 2015). Many London eighteenth-century cutters' names are known, but Amsterdam Diamond Cutting in London • 199 was becoming an increasingly significant city for diamond cutting, while in London cutting was dwindling. Tjil Vanneste has recently written about the extensive diamond-dealings of the London merchant James Dormer who moved to Antwerp and his trade networks with Lisbon, Amsterdam, and elsewhere based largely on correspondence preserved in Antwerp (Vanneste 2011, 2015). Dormer had most of his diamonds cut in Amsterdam. Price seems to have been the main issue, and continued to be so. In 1813 the British mineralogist John Mawe still held English diamond cutters to be the best, but admitted that their numbers were "so small as to occasion many stones to be sent to Holland where, from the greater number and more active competition of the artists, the price of workmanship is considerably lower" (Mawe 1813, 59–60). In his second edition ten years later, he was more succinct: "The Dutch have engrossed almost all the trade, as we are unable to compete with their prices, labour being so much lower in Holland" (Mawe 1823, 82). In 1849 it was widely reported in the British press that "There is only one diamond cutter in London" (for example, Worcester Journal, 2 August 1849). In 1852 the Koh-i-Nur ("the Mountain of Light") diamond, acquired by the British crown from Maharajah Duleep Singh, was recut. This operation was undertaken at Garrard, the crown jewelers in London, with the Duke of Wellington "inaugurating the work by himself cutting the first facet" (figure 10.5). Garrard had to obtain advice on the cutting and, perhaps to national shame, "consulted Mr. G. Coster, of Amsterdam; the trade of diamond-cutting having entirely left this country, and being at present chiefly confined to Holland" (Illustrated London News, 24 July 1852). Two skilled workmen were brought from Holland to do the work. A few years later an anonymous writer in the American weekly Appleton's Journal commented: "One hundred years ago England cut almost all the diamonds of the world, but, strange to say, early 200 • Diamond Cutting in London Figure 10.5. The cutting of the Koh-i-Nur, Illustrated London News, 24 July 1852. In the center, the Duke of Wellington starts the process. In this century the entire business was transported to Holland, and now Amsterdam monopolizes this trade nearly altogether" (Anon 1871). In 1696 John Houghton decried the drop-off in England's diamond trade that was already noticeable by then, but suggested that there was considerable business opportunity in promoting the wearing of diamond jewelry. As he philosophically noted, "Every Dog has his Day, and every nation its Fate: Had we continu'd growing as we then grew, we had by this time been a Monster; and it's probable most of our Neighbors would have been afraid of us. But however, the best way to re-gain that Trade is to have them [diamonds] in fashion in a high Degree. This will incite an industry to procure them, and much encrease our Trade at home to get materials to purchase them with, or to buy Money that shall do it. When there is no Goal to run to, the Racers are sluggish. And so much for Diamonds" (Houghton 1727, 73–74). Diamond Cutting in London • 201 In the past, as today, diamonds were a sign of wealth, if not wealth itself, and their value was of concern to dealers and owners alike. We have details of diamond prices dating back more than a millennium and actual price lists for at least half of this period—and formulae for calculating values. Value, of course, depends on size and quality, and as we shall see in this chapter, we have explanations of the criteria for judging diamonds ranging in date from some of the earliest Indian

texts up to the remarkably contemporary- sounding instructions of Sir William Perry in the later 1600s. 11 The Value and Assessment of Diamonds Diamond Prices in the Ancient and Medieval World The classical world provides little data on the value of diamonds other than when the Roman poet Marcus Manilius in the early first century AD said that diamond was more valuable than gold. A generation later Pliny called it “the most valuable of all human possessions” (Manilius, *Astronomica* 4.926; Pliny, *Natural History* 37.15). This is minimal information, but as the Portuguese doctor Garcia de Orta pointed out a millennium and a half later, these classical writers were neither jewelers nor lapidaries (Markham 1913, 343). Early Islamic writers provide some pricing evidence. Al Kindi, according to al- Birūnī, said, “One mithqal of it [diamond] the size of the grain of a pepper fetches a price of eighty dinars. I have not seen a stone bigger than the pine nut. The bigger pieces are three to four times costlier than the smaller ones” (Said 1989, 80). The mithqal had an average weight See figure 11.3. 203 of about 4.25 grams, which was also the weight of a gold dinar coin. This allows us to say that in very approximate terms, and assuming peppercorns then compare in size with those today, a diamond of around 0.4 carats would then have been valued at the equivalent of about seven grams of gold. Ahmad ibn Yusuf al Tifashi, the early thirteenth- century Arabic poet and author of a comprehensive book on minerals, also quotes al Kindi, but notes that the price of eighty dinars a mithqal was for the most expensive diamonds; the cheapest diamonds on sale in Baghdad were just fifteen dinars a mithqal, but it is uncertain whether this applied to smaller size or poorer quality or both (Abul Huda 1998, 120). Al- Bīrūnī also reported the Razi brothers as saying that a dirham “of the small grains [of diamond] were priced at 100 dinars ” (Said 1989, 80). These Razi brothers were presumably the Baghdad-born scholar Sha rif Razi (AD 970–1015) and his slightly older but equally erudite brother popularly known as Alam al Huda. The dirham was about three grams, so their value was more than half again as much as al Kindi’s top price had been just over a century earlier. The Razis also seem to say that a larger single diamond was worth one thousand dinars. If they mean a single diamond weighing a dirham, that would be one of fifteen carats. Tifashi explained that the average price for a diamond in his day was two dinars a carat, thus the equivalent of about 8.5 grams of gold, but that “if a rare large stone of half a mithqal [just over ten carats] suitable for a finger ring is found, its value is double that of the mustard seed size, three times the filfila [seed] and four and five times more” (Abul Huda 1998, 120). A per- carat price of just double that of the mustard- seed size seems far too low; possibly his text is actually a reference to the square rule of diamond pricing as discussed below. In India, the primary source of diamonds to the ancient and medieval worlds, there was a mercantile approach from an early period. The prices given in the *Ratnapariksa* of Buddha Bhatta 204 • Value and Assessment of Diamonds and the *Brhatsamhita* of Varahamihira escalate with the size of the diamond, but the underlying formulae are not clear (Finot 1896, 11, 62). However, in the *Agastimata* of uncertain date, but pre- fourteenth century, a base price per carat is multiplied by four times the weight minus one. Thus, a dealer deciding a fair base price for a certain stone is twenty units a carat would price an eight- carat one at $20 \times 4 \times (8 - 1) = 560$ units (Finot 1896, xxix–xxx). In the early fourteenth century, the Indian mint- master and mathematician Thakkura Pheru listed prices for small diamonds on the basis of how many together weighed a gumja—a weight of about 0.76 carats (Sarma 1984). If we make a very approximate calculation based on contemporary silver coinage and modern silver values, a 0.1- carat diamond would have cost about £0.025, a 0.2- carat one about £0.1, and a 0.4- carat one £0.4. These prices seem far lower than the medieval Islamic prices. On the other hand, larger stones were far more highly

priced. According to the values Pheru gives in gold coinage, the value of a 1.5- carat diamond would be the equivalent of about 130 grams of gold, an eighteen- carat stone well over one hundred kilograms of gold (Sarma 1984, 76). The high prices for large diamonds in India as well as the apparent embargo on their export prior to the later medieval period, as described earlier, explains why the diamonds reaching Europe were in the main very small. The two diamonds owned by Richard de Blountesham, seemingly a wealthy London taverner at the time of his death in 1317, were valued just at six shillings and eight pence (£0.33) (Riley 1868, 124). They must have been minute. Fifty years later, in April 1367, a couple unsuccessfully demanded the return of certain goods that they said had been left for safekeeping. Included were six gold rings with gems identified as sapphires, rubies, and one “dyamand.” The value given for all six rings was just £2.65 (Thomas 1929, 75). With the later fourteenth century came diamond cutting, Value and Assessment of Diamonds • 205 which had a great impact on pricing. The earliest European Figure 11.1. First page of a 1572 list of diamond prices by Juan de Arfe y Villafañe. Credit: From de Arfe (1572). document to give separate prices for cut and uncut diamonds seems to be that written by a Jewish gem merchant in Venice in 1403 (Sirat 1968). Here, rough was half the price, weight for weight, of the “well- cut” stones, with prices increasing exponentially with weight, but not according to any precise rule that I can discern. The reader was advised that the prices were for good- quality stones and to be careful to avoid faults and check that the faces of the octahedral rough stones are “harmoniously ordered.” With poorer quality, the writer wisely recommends to “look twice before buying, and buy them cheap.” One thing to look out for, he tells us, was a glaz in the stone—the Yiddish term gletz is still used in the diamond industry to describe small fissures. Once into the sixteenth century, the direct sea route to India supplemented the overland routes, and Portugal started to play a prominent role in the diamond trade. In 1572 Juan de Arfe y Villafañe (1535–1603), a goldsmith and artist of German origin living and working in Spain, published a book on assaying and included the weights of gems. In this he gives the prices in gold ducats for cut diamonds and several other gems in sizes from one to ten carats (figure 11.1). The columns show carats (Quilatos) and grains (Granos), a grain being one- quarter of a carat. Since the gold ducat was 3.5 grams of near- enough pure gold, we can gain a good idea of diamond prices in relative terms (figure 11.2). With a gold price today of about \$40 per gram, in relative terms a one- carat diamond would be \$7,000, a five- carat one about \$175,000. The “Square Rule” De Arfe’s diamond prices follow the “square rule,” which became widespread in sixteenth- century Europe. De Arfe has a 206 • Value and Assessment of Diamonds Figure 11.2. Diamond prices of 1572, from Juan de Arfe y Villafañe (see figure 11.1), calculated in terms of grams of gold. Graph: Jack Ogden. base price of fifty ducats per carat. Thus, a one- carat diamond would be worth fifty ducats, a two- carat diamond $50 \times 2 \times 2 = 200$ ducats, a three- carat one $50 \times 3 \times 3 = 450$ ducats, and so on. 1 One of the earliest European mentions of this square rule can be found in the Livro de Duarte Barbosa written around 1516, although this was for rubies sold in India, not diamonds, for which Barbosa’s prices escalate in a more linear way (Barbosa 1866, 209–14). This may suggest that the square rule originated in India. When Richard Hakluyt, the English writer and collector of early travelers’ accounts, noted diamond prices at the end of the sixteenth century, he gave them in Portuguese reales. His prices differed between fully cut, pointed (probably meaning uncut), and chapas —that is, cleavage fragments or thin, Indian- cut tables where there was “gaine made by workinge them” (Jones 1850, 158–59). Hakluyt’s prices range from uncut diamonds weighing just a fifteenth of a carat to one- carat perfect diamonds, “worked on all sides,” at 25,000 reales. For diamond above a carat,

Hakluyt says that prices “rise double in value [value],” presumably a reference to the square rule. The British travel writer and surgeon John Fryer, writing in 1698, explains that in pricing diamonds, the “square rule” should be accurately observed and provides one of the more detailed descriptions of its application (Fryer 1698, 294). Like Juan de Arce y Villafañe, he notes how diamond weights involving fractions of a carat were calculated. The smallest fraction used was one-quarter of a carat, a grain, and the square rule applied. With a base price of £10 per carat, a diamond of one-quarter of a carat (one grain) was worth $£10 \times (1/4 \times 1/4) = £0.625$. Similarly, a half-carat stone was worth $£10 \times (1/2 \times 1/2) = £2.5$. For larger stone weights involving fractions, the weight was first converted to grains and then multiplied by the grain price. Thus, with a carat base price of £10 as above, a 1.25-carat diamond would be five grains, and this squared and multiplied by £0.625 gives £15.625. (Due to misprints or copying errors, the figures given by Fryer do not always tally, but he explains the procedure clearly.) The square rule was by no means always applied and in any case fell out of favor during the eighteenth century—although it was in use for natural pearls until quite recently (I remember being taught it myself). In his 1751 second edition of *A Treatise on Diamonds*, David Jeffries still described the square pricing rule. A footnote in the fourth edition of 1871 comments: “The mode of calculating the value of stones has, since the days of Jeffries, undergone considerable modifications, and it is difficult now to lay down any exact rule of valuation” (Jeffries 1871, 25).

Renaissance Pricing An early and comprehensive description of diamond values and assessment in the English language is that of Gerard Malynes’s *Lex Mercatoria* (The law merchant). This was first published in 1622 and reprinted, not always accurately, several times over the following decades. Malynes is a particularly reliable source because he was a merchant, had spent time in Antwerp, was a government adviser on trade, and had himself run diamond-cutting mills. He describes different cuts of diamonds, prices of rough and cut, price variations with color, and other essential factors necessary for those wishing to trade in diamonds (Malynes 1622, 74–77). Malynes’s work thus stands as a snapshot of the diamond market around 1600, at a time when the English and Dutch East India Companies were about to change the balance of power in the European diamond trade. He first lists prices for small diamonds, noting that he had drawn this information from that “set down at Paris in France, during the reign of the French King Henry the fourth, by the Jewelers there.” Henry IV reigned from 1589 to 1610. This list covers rough diamonds weighing from 0.1 to 4 carats, with prices given in French crowns per carat. From the rate of exchange he gives, a 0.1-carat diamond would be worth £0.15 (for convenience, prices here are given in decimals of a pound rather than in the pounds, shillings, and pence used in the past). In the same list, a one-carat rough diamond was the equivalent of £5.7, a two-carat diamond £18, and a four-carat £72. In contrast to this theoretical list, he gives the prices actually paid for rough diamonds bought at Lisbon at about the same time that the Parisian jewelers’ list was compiled—£0.0625 for a 0.1-carat diamond, up to £3.75 for one-carat native (uncut) diamonds, and £3.125 for one-carat “flat stones,” presumably cleavage fragments or flat Indian-cut stones. Elsewhere he says that a flat rough stone was valued at a third less than a pointed one. There was always an element of a gamble when buying rough because, as Malynes says, it was “uncertain what may be diminished of the Weight by the Workmanship of it,” but things were more certain for cut stones. For cut diamonds, Malynes gives prices in English pounds, with a one-carat one at £30, a two-carat one at £60, and a four-carat one at £200. The differences between rough and cut prices reflect not just a dealer’s profits, but the often-significant loss in

weight during cutting as well as the actual cost of cutting, which he says was £0.5 to £0.6 per carat. Diamonds over four carats were rare because, Malynes tells us, hitherto they had all belonged to “the kings in the places where [sic] they were found.” He also explains the “square rule” for pricing. In the example he gives, there is a base price of £25 per carat, so a ten- carat diamond would be $£25 \times (10 \times 10)$, or £2,500. He says that cut diamonds over ten or twelve carats in weight were too rare to be subject to such a formulaic approach and were “sold by estimation, as the love and fancy of a man will carry the same.” Malynes explains, perhaps unexpectedly, that “pointed Diamonds” had previously been cheaper than table cuts because there was less waste in cutting, but were now “dearer and more esteemed” (Malynes 1622, 76). He also notes that demand would affect prices: for example, a rise in price might be brought about by “the marriages of Princes and great People.” John Fryer said that on average a diamond would lose just a third of its weight in cutting and that “Rough, Brute, or Uncut Stones, are in Value half the price of Cut or Polished Stones.” However, the cutting of Nathaniel Chalmers’s “great stone” of sixty carats “wasted near two thirds,” and Pitt’s diamond, later the Regent Diamond, about the same, as we saw in the previous chapter. To get an idea of the final size that might be cut from a large piece of rough, a cast of the rough diamond could be made in lead and then filed to determine the best eventual shape and size. Fryer explained that the weight of the final diamond could be calculated because of “lead being exactly three times as heavy as a diamond” (Fryer 1698, 213–14). However, “perfect lead must be used, not the much lighter tin” (he may mean a lead- tin alloy), and the lead should be “second lead,” not “first lead.” In practice, lead has a specific gravity slightly more than three times that of diamond, but if “second lead” Value and Assessment of Diamonds • 211 meant lead with a small tin addition, then the formula could be accurate. Other mentions of the use of lead casts in this way include a mention from 1530 in a document of François I of France (1515–47), perhaps the earliest, and Johannes de Laet in 1631 (Bapst 1889, 18; de Laet 1647, 6). A few years later the Portuguese lapidary Baltasar Cornejo made two lead casts of a large diamond to determine how best to cut it to avoid an inclusion (Crespo 2015, 35). Among surviving examples is the lead cast of the “French blue” from the French crown jewels, which allowed researchers to determine that the Hope Diamond could indeed have been cut from it (Farges et al. 2009). Figure 10.3 shows lead models of the Regent or Pitt Diamond made before and during cutting. Lead casts would only have been made when relatively large diamonds were being cut. The jeweler Hannibal Gammon, who bought rough diamonds and employed diamond cutters, gives a list of diamond prices in his 1606 Goulesmythes Storehouse. This list is headed “Value of diamonds . . . bought at Goa in the Indies” (Gammon 1606). William Heth, “a clerk of his majesty’s store for the navy at Portsmouth,” not a jeweler, repeated the same list in his *The Goulden Arte, or The Jewel House of Gemes*, but left off that defining heading (Heth 1603, 63v–64v). David Humphrey, a jewelry historian, has suggested that the production of these works by Gammon and Heth “marked changing attitudes to the dispersion of what had previously been considered as knowledge about the goldsmiths’ art to be fiercely guarded and kept secret” (Humphrey 2010). Other Costs As a modern jewelry appraiser would tell you, value is affected by place. The seventeenth- century Armenian historian Arakel of Tabriz knew this when he said that “not all jewelers in differ212 • Value and Assessment of Diamonds sent lands value them [diamonds] in the same manner” (Bournoutian 2006, 457). There will be huge variation between the price a merchant might pay at the mines in India and what a jeweler in Lisbon, Paris, or London would pay. And prices were always subject to negotiation, particularly with larger stones. The French traveler Jean de Thévenot described the prices normally

paid for different sizes of diamonds at the diamond trading center of Golconda in India, then noted, “However the price is not fixt, for one day I saw fifty crowns a Mangelin payed for a Diamond of ten Mangelin, and the next day there was but four and forty a Mangelin payed for another diamond that weighed fifteen Mangelin” (Thévenot 1687, 98). In another case, a diamond ring was valued by three different jewelers: two assessed it at £25, the third at about £35 (Foster 1923, 274). Europeans might also pay higher prices than other nationalities. According to the early- sixteenth- century J awāhir- Nāma, you could buy a good- quality t wo- carat diamond in th e market at what is now Kalaburagi (some two hundred miles due west of Hyderabad) for ten florins a carat and sell it to the Europeans for forty (Digby 2008). Alternatively, you could buy a rough diamond at four florins a carat, get it cut by a European cutter, and resell it in India for fifteen florins (Digby 2008). The version of Jawāhir- Nāma publish ed by James Prinsep says you could buy a two- carat sto ne for seven florins a carat and sell it for fifteen when cut (Prinsep 1832, 355). Cutting here might have been very basic since potential weight loss would render more sophisticated cutting less economically tempting. Arake’l of Tabriz repeated almost exactly the same information about buying in India, sending it to Europeans to cut and then reselling at a profit that, although probably out of date by his time, is further indication of a common source for these texts (Bournoutian 2006, 458). Once back in Europe, there were other costs that influValue and Assessment of Diamonds • 213enced the selling price of a diamond. When diamonds worth £921.01.11 were sent to London in 1668, the charges included East India Company “permission” at 1 percent, various portorage charges, plus the cost of an iron chest totaling £10.6.3 (Cholmley 1664–93, fol. 0141). Greater expense accompanied the sale of a large diamond to Queen Mary II, co- ruler with William III, in 1689/90, as recorded in a handwritten note preserved in the British Library (Add. Ms. 44925, fols. 67–75). The seller was Sir William Langhorne, but others were involved. T he total price was £12,338.15.6. Of this, £10,000 for the diamond itself was divided between Langhorne and others. The balance covered costs ranging from gratuities and exchequer fees to £9.11.0 for “Coach hyre to Hampton Court & to the Exchequer & Lord Portland’s &c several times[?]” A certain Lord and a Lady received significant sums of money, but their names were deliberately obliterated for reasons that can only be surmised, and finally there was a “Commission for Sale of the said Diamond at 11/2 per cent, £180.0.0.” In addition, the “hazard and risqué of cutting” and apparently the cutting charge itself were borne by the sellers. The note does not mention the weight of this stone, only that “Its exceeding greatness takes away all Defects if any. That which is above all weight rule & measure cannot be subjected or estimated by ought but it Selfe or its equal which is noe where to bee had or found for fifty thousand Pounds.” The stone would be cut as her Majesty commanded, and “it having soe great a light in it will appear play with the greater vigor of [one] that they have asked £30,000.” It would, they said, “make a perfect hart [heart] for the head or breast.” Assuming we ignore the protestations that the stone was worth far more and take £12,000 to represent a fair price for the cut stone, it probably weighed around thirty- five carats when cut. The diamond was paid for in irregular installments by the exchequer between 7 January and 22 September 1689/90. 214 • Value and Assessment of DiamondsT he costs involved in Jean-Baptiste Tavernier’s sixth and final diamond- buying tr ip to the East in the 1660s included a fine imposed by Ottoman customs officials and a commission to Jean Pitan for his help in selling the diamonds to Louis XIV (Ogden 2017). These costs were shared between the Parisian merchants who financed Tavernier’s purchases. T he Florentine Diamond Records of sales at the top end of the market, often to European royalty, can sometimes throw light on transactions involving diamonds that exist today,

as we saw with the Sancy and Pitt Diamonds in the previous chapter. In the British Library there survives a copy of an Italian letter dated 18 October 1599, presumably to the Grand Duke of Tuscany, from the Cardinal del Monte, concerning the duke's negotiation for "a diamond of great value" belonging to the Count di Monsachio (presumably meant, or misread, for Monsanto) (Lansdowne MS 1054/6, fol. 40). This was what we know as the Florentine Diamond, now in Vienna, a yellow diamond that Tavernier says he had been shown several times and of which he provides a drawing (Ball 1889, 2:98). This gem, shown at the bottom of figure 10.3, was said to have been given to the Portuguese governor in Goa by the "King of Narsinga." Cardinal del Monte represented the interests of the Grand Duke of Tuscany and facilitated this transaction, completed in 1601, by which Ferdinand, Duke of Tuscany, paid 35,000 gold crociati (crusadoes) for the stone (Efemeridi 1781, 6 January 1781, 4). This "Great Dukes faire diamond, which he keeps under lock and key," was seen by Richard Lassels, a priest who traveled through Italy and wrote of his experiences. He notes that the diamond was "absolutely the fairest in Europe," weighed 138 carats, and was almost an inch thick. He says that he described it to a famous jeweler in Value and Assessment of Diamonds

- 215 Lyon, France, who valued it at "a hundred thousand crownes between marchant and marchant, and a hundred and fifty thousand crownes between Prince and Prince" (Lassels 1670, 183). This is a reminder that value depends on whether one is buying or selling, and to whom, and, as Garcia de Orta had wisely said, on "the will of buyers and the need for them" (Markham 1913, 342). Every sale needs a willing buyer and a willing seller.

Price Fluctuations Copious documentation allows us to see the price fluctuations for more commercial sizes of diamonds through the seventeenth century. Hugh Greete, the East India Company's diamond buyer in Borneo between 1613 and 1618 and seemingly aptly described as "by profession a jeweler, but in practice a juggler," complained in 1615 that he didn't know what to pay for diamonds and was thus "forced to buy them here at haphazard, and not knowing whether I overrated them or not, having been long out of England, in which time (for ought that I know) the prices of them may alter" (Foster 1899, 257; Ogden 2005). The Thirty Years' War that affected much of Europe between 1618 and 1648 has been blamed for a fall in diamond prices. In 1672 war in Europe is again blamed for a diminishing of the diamond trade, but about this same time, Sir William Petty countered this by saying that diamond prices could go up "When they are bought up on feare of war" (Cholmley 1664–93, 0153; British Library Ms. Add. 72897, 14, 105). In spring 1659, diamonds were "despicable in England by reason of their glut, hardly affording their prime cost," and prices appear to have remained depressed through the 1660s (Foster 1921, 203). A letter from John Cholmley in London to his brother in India written in November 1668 talks about "Dyiamonds being now very cheap here [London]" (Cholmley 1664–93, 0142). The same year he

- Value and Assessment of Diamonds also said that diamonds weighing between half a carat and two carats were most in demand, but they had to be of good quality as "ordinary ware will not sell"; larger stones were relatively cheap (Cholmley 1664–93, 0140–0141). In 1670 diamonds were "soo deare in India" because of the quantities exported, and a year later "cheaper than formerly" in England because there were few rough diamonds imported that year into Holland and none into Portugal (Cholmley 1664–93, 0147, 0150–0151). The profit was largely in the cutting, for which London was then the center, and John Cholmley added, "I am resolved not to show them [good large diamonds] to any person rough, but to cut them and make the most of them." The East India Company Court Minutes in September and December 1678 refer to a rise in prices of diamonds in India, but this was short lived (Sainsbury and Ottewill 1938, 209, 234). In 1682 Nathaniel Cholmley wrote from St. Helena, finally en route home from India, to those

still in India, telling them to ignore his previous instructions to invest in diamonds because prices were “much fallen” in London—news that he had presumably heard via an outward-bound ship at St. Helena. We can sense the anxiety in his letter: “It is my request, desire and order, that if when this comes to your hands, you have made no Investment in Dyamonds, you desist from making any” (Cholmley 1664–93, fols. 0050–0051). This fall in diamond prices in London in 1682 is revealed by numerous documents in the Cholmley letters and East India Company records (Cholmley 1664–93, fols. 0052–0053, 0060, 0067). The market continued “very dull and low” in 1683, but it seems this was for fairly large diamonds because “small under 7 or 8 grains are desired and rather under 6 grains than bigger” (Cholmley 1664–93, fol. 0076). Another letter of December 1683 says “the Marketts for good diamonds are very low here and bad ones are a very despicable comoditt [sic]” (Cholmley 1664–93, fols. 0077–0078).

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Judging Quality As these remarks about quality show, assessing a diamond by size was not everything. Color, clarity, and cut were important—these three, along with carat weight, being the “four Cs” of recent diamond marketing and grading. We have already encountered early Indian texts that discuss the colors and clarities of diamonds. Different colors were associated with different castes or wear on different parts of the body, and diamonds with internal flaws were to be avoided. There had obviously been a long need for those who could assess the quality and thus value of gems in India. Pheru in the fourteenth century, for example, explained the various things to look for in diamonds and described properties that could help establish their genuineness, including hardness and even specific gravity (Sarma 1984, 46–53). He explained that experts who understood both the theory and practice of gems were termed Mandalikas, although this occupation was not open to those of low caste, with physical deficiencies, or of obvious disrepute (Sarma 1984, 72). Understanding gems was even a useful talent for young ladies, as the Kama Sutra tells us, an old Indian text better known for its other instructional content (Burton 1883, chap. 3). Naturally, the jewel-loving Mughals needed the relevant experts. The emperor Aurangzeb, for example, had at hand three specialists: one, a Persian, seemingly with overall responsibility for the emperor’s gems; another Persian who concerned himself with the monetary aspects; and a third, who was a member of India’s merchant caste, a bania, who could assess quality and spot imitations (Aziz 1942, 142). The man in figure 11.3 is apparently such an expert. He is weighing the gems, probably including diamonds, belonging to Rustam Khan (d. 1658), who was an important military personage under Shah Jahan. This small painting is from the border of a portrait of Rustam Khan, itself a page from an impressive 218 • Value and Assessment of Diamonds

Figure 11.3. Detail of the border in a Mughal album showing a specialist weighing the gems of Rustam Khan (d. 1658). Credit: Chester Beatty Library, Dublin, 07B.35a. Mughal Muraqqa or album now in the Chester Beatty Library in Dublin (Wright and Stronge 2008, 384–85, cat. 61). In Europe, clarity, freedom from internal marks, was equally important. In letters to his brother Nathaniel in India, John Cholmley time and time again exhorts him to invest “in the largest rough Dyamonds you can procure of Christaleene Water and as cleere of ffoules as may be possible, lett what you send us bee of the very best (though you pay the deere them).” Flawed and veined stones were less valuable and difficult to cut, and they were best avoided. John Fryer pointed this out: “Care is to be taken likewise in Choices of Rough Diamonds, to avoid those that have veins, for they will never cut well” (Fryer 1698, 213). Henry Steel added: “But if you be not careful, the Indians will throw one of these stones into a parcel, and oftentimes the Value and Assessment of Diamonds • 219

largest” (Steel 1779, 95). According to Arake’l of Tabriz, the Europeans in Aleppo, Syria, said that diamond “is not worth anything without

polishing it, for there are impurities in it that cannot be seen prior to polishing” (Bournoutian 2006, 459). On the other hand, Tavernier noted that in India they would hide flaws under facet junctions in cut stones, a trick for which modern diamond graders are taught to be aware. Gerard Malynes also mentions the higher value of diamonds “without spots or sands, burbles, flaws and vaines” (Malynes 1622, 75). When Jahangir, Mughal emperor from 1605 until 1627, had doubts as to the relative quality of two diamonds that his own jewelers were unable to resolve, he asked the advice of the defeated Kokra ruler Durjan Sal, an expert on diamonds. Durjan Sal pointed out a flaw in one of the diamonds and proved his point by having the diamonds tied to the horns of fighting rams. After the fight the flawed diamond had broken, and the other remained intact (Blochmann 1871, 111–29). It wasn’t always easy to predetermine the color or clarity the diamond would have once it was cut. As Gerard Malynes had explained, the color or “water” was only properly discerned after cutting (Malynes 1622, 75). Charles V of France had received from his father John II, thus prior to the latter’s death in 1364, a large diamond that was described as square but not very fine and not of good water (*n’est pas de bonne eau*) (Laborde 1851a, 83). This is a very early European use of this term water to describe the color of a diamond, although it was an old Indian expression even then.

Fancy Colors From ancient India to modern Fifth Avenue, the epitome of a high- quality diamond is the colorless. As Gerard Malynes said, “The best waters are whitish, inclining to blue, which maketh 220 • Value and Assessment of Diamonds the best illustration and play, as some call it . . . but the facets must be industriously wrought” (Malynes 1622, 75). The “illustration and play” was presumably the dispersion or color flashes that had been admired in India two millennia earlier. Hannibal Gammon said more briefly in 1606 that “the colour of the Diamond is properlie of noe colour” (Gammon 1606, 65v). However, color preferences could vary with place. Thus, Malynes tells us, “Diamonds of yellow water (which give luster extraordinary by candle- light) are more in request in Germany and some places in Italy, where the brown diamonds are also desired. But in England and France they are worth 1/3 part less” (Malynes 1622, 76). Indian color preference had been noted far earlier by al- Bīrūnī, who said: “One should blow his breath over the diamond until it gets warmed, then place in a basin of saline water in which silver has been washed. If it appears white, it is of the finer kind. It is then used for the adornment of swords, necklaces and all other jewelry that is used to adorn the upper part of the body. If it appears red, it should be suitable for the jewelry worn in the middle of the body. If exhibiting yellow color, it is suitable for use in bracelets, rings, armlets, etc. The black kind is suitable for ornaments of the feet. The people of India also say: ‘If worn contrariwise to this arrangement and if these colors are employed for the adornment of other instruments and jewels, it will shatter with the impact of lightning’” (Said 1989, 76). Attractively colored diamonds, often highly valued today, were treated with little appreciation until relatively recent times. Today a fancy- color diamond with a sufficiently attractive hue would be an asset rather than a detraction. The color varieties of diamond are enumerated in early Indian texts and copied by Islamic writers, such as Mansur in the thirteenth century, who reported seven colors: white/transparent, pharaonic, olive, red, green, black, and fire colored (Hammer 1818, 347).

Value and Assessment of Diamonds • 221 However, colors other than white (colorless) do not seem to have been particularly highly valued in India, even if exceptional. The Mughal emperor Jahangir referred to one blue diamond brought to him as looking like a sapphire, something he had not previously seen. Nevertheless, his jewelers valued it at less than a sixth of the price had it been colorless. A number of other colored diamonds are mentioned in both Eastern and European records; one example is a clasp set with a pointed blue diamond noted in an inventory of Charles

the Bold in the fifteenth century (Laborde 1851b, 144). In 1698 John Fryer noted, “the Rough Diamonds that seem greenest, prove of a good Water when cut; and those that seem white when rough, prove often bluish being cut” (Fryer 1698, 213). This was important to understand because, says Fryer, a diamond that “is of a Blue, Brown or yellow water, is not worth half the price of a perfect Stone of a White Water.” Tavernier reported that Mir Jumla, a prominent provincial governor under the Mughal emperor Aurangzeb, showed him five small bags of diamonds, all *lasques*—that is, flat, Indian-cut stones—and “of very dark water and very small.” Tavernier explained that there was little market for them because “in Europe we do not esteem diamonds if they are not clear and white, and we make no account of other kinds of water” (Ball 1889, 1:130). Mir Jumla sent his diamond miners back to agricultural labor. Despite this setback, Jean de Thévenot reported that Mir Jumla owned “Four hundred and eight Pounds of Holland weight” of diamonds—getting on for 2,500 carats (Thévenot 1687, 103). Indeed, colored diamonds do not seem to have attracted much serious attention in Europe until Jean-Baptiste Tavernier brought back from his sixth voyage to the East the large blue diamond that he sold to King Louis XIV of France in 1668 for 220,000 livres. His invoice describes the stone as a large blue 222 • Value and Assessment of Diamonds diamond, in the form of a heart, that is pear-shaped, cut in the Indian fashion (Bapst 1889, 403; Ogden 2017). The stone eventually became the Hope Diamond. Half a century after Tavernier’s sale, the arrival of what we now know as the Dresden Green diamond in Britain was widely reported in the press. For example, the 25 October 1722 edition of the *Whitehall Evening Post* said: “One Mr. Marcus Moses, lately arrived here from India, and had the Honor to wait upon his majesty on Tuesday last, with a large Diamond of the Color of an Emerald, perfectly fine, and without the least Defect, the like of which, ’tis said, was never seen in Europe, and with which Curiosity his majesty was highly pleased.” The king didn’t buy it, and in the *St. James’s Evening Post* of 23 June 1733 it was reported that Moses had sold the diamond to “the Emperor of Germany” for £36,000. This may have been premature. The gem was certainly offered to Frederick Augustus I, but most accounts, such as that by diamond historian Ian Balfour, place the actual sale nearly a decade later to the emperor’s son (Balfour 2009, 94–97). Later that century the Anglo-French surgeon and author John Obadiah Justamond, translating the French of Abbé Raynal, wrote: “There are diamonds of all colors, and of every shade of the several colors. The diamond hath the red of the ruby, the orange of the hyacinth, the blue of the sapphire, and the green of the emerald. This last is the most scarce and the dearest when it is of a beautiful color” (Justamond 1784, 3:411). The pendant in figures 8.6 and 11.4 is an interesting example of rose-cut diamond jewelry that dates to a time roughly between the arrivals of the Hope and Dresden diamonds in Europe. This ornament, now a brooch but originally probably a necklace pendant, is a rare example of a piece of jewelry that contains a deliberately chosen color range of diamonds, several strongly colored. A century later, the British mineralogist John Value and Assessment of Diamonds • 223 Figure 11.4. Detail of the colored diamond ornament in figure 8.6. Credit: Courtesy of Benjamin Zucker. Mawe said that “when distinctly pink, blue or green,” the value of diamonds “is much enhanced and eagerly sought for by connoisseurs” (Mawe 1813, 16). The Cut was also important in assessing value. This was not simply a matter of what style a diamond was cut in, but its proportions and condition. Poorly cut or damaged facet edges or corners would reduce value. For example, the early seventeenth-century *The Goulden Arte, or The Jewel House of Gemes* notes what it considered good proportions and advised that a diamond “must be without any fault both in Corners and Sydes and every one of the 4 corners must be sharpe and cleane cut” (Heth 1603, 65r). However, proportions were not all about aesthetics. The

same document notes that a thinly cut diamond when set can appear larger than it is, and thus was worth more per carat (Heth 1603, 65v). Similarly, stones that were particularly deeply cut “which maketh the wayght not to any profit” were valued less (Heth 1603, 66r). 224 • Value and Assessment of Diamonds

In practice, diamonds, table-cut in particular, were prone to have uneven edges and missing corners. In some cases this was due to damage, but frequently this was to minimize weight loss in cutting. As we saw above, the uneven edges of the settings surrounding diamonds in many sixteenth- and seventeenth-century jewels are not poor workmanship—they actually follow the irregular contours of the diamond, as in figure 7.10. When a diamond did have good edges, this could be pointed out. The deed of sale of a diamond to a London jeweler in January 1586/87 described it as “one greate square table diamond, full cornered and without fault, set in a ring of plain golde” (CP 14/42). Twenty years later, Sir Arthur Gorges offered to sell the Earl of Salisbury jewelry including “a large table diamond very perfect in all its corners” (Giuseppi and Lockie 1965, 141). The overall assessment of a cut diamond thus covered many aspects. Fryer explained, “Neither the Thick nor too Thin in Substance is best; a Thin Stone, which is High and Narrow Table, not making a shew answerable to its Weight, must be valued at less than that which is well spread, hath its corners perfect, and a pure white: without Spots or Foulness, is called a Paragon Stone, and in full perfection” (Fryer 1698, 213). An Early Explanation of Diamond Grading

The most comprehensive document relating to the evaluation of a diamond can be found in a handwritten document now in the British Library in London (BL Add. 72897, 14, 105). Titled “Enquiries into the Values of Diamonds,” this was written by Sir William Petty, an English economist, scientist, and philosopher who died in 1687. The manuscript probably dates to around 1682. As common for the period, it is presented as a dialogue between two people: a young man who has bought a diamond ring and is worried that he may have been cheated, Value and Assessment of Diamonds • 225 and Sir William, who explains how diamonds are assessed and valued (Ogden 2012). Sir William begins by pointing out that because the young man had bought the diamond already set in a ring, it was impossible to accurately judge its weight, proportions, and color, and that the assessment of its clarity, what he calls the “clouds, icicles & points” within the stone, was also hindered because you couldn’t see around the stone, only in through the front. During this period diamonds were set with closed backs. The text goes on to explain in detail how a diamond should be examined prior to setting. The four criteria he defines are essentially the same as the four “Cs” we use today—carat weight, cut, color, and clarity; he calls them “Weight, Extent, Colour, & Clearness.” Weighing should be carried out with “a pair of scales that will weigh with certainty to less than a quarter of a grain.” “Extent”—or what we should describe as size and proportion—was assessed with a special measuring gauge, made from a piece of transparent mica or thin horn on which lines forming a square one inch by one inch were inscribed with a sharp point. This square was subdivided by finer lines, twenty in each direction, creating a twenty-by-twenty grid. The diamond was viewed through this and its dimensions noted. To aid the observation it helped to make “every fourth division in a line something bigger than the rest for distinction sake.” To judge color—what was then termed “water”—you “must have 5 or 6 diamonds to lie constantly by you each of a several water and you must have in the opinion of the best jewelers the proportion of value which the said waters to bear one to another.” The same was true for clarity—“Clearness.” “You must have as many foul diamonds as do contain samples of every sort of fault and a note of such abatements [in value] as an experienced Jeweler would make for every such fault.” Petty adds, 226 • Value and Assessment of Diamonds “you must also have a pair of excellent spectacles for

the older sight” and advises use of “a good microscope.” He preempts, in almost every way, the approach to diamond grading used by gem laboratories worldwide today. The document goes on to describe pricing and price abatements for different colors and clarities. Petty’s approach was comprehensive but not unique. The so- called Sloane Lapidary, which dates to about the same time as Petty’s text, also said that the cut and proportions of a diamond impacted on their value (British Library, Sloane MS 2539; Harris 2009, 155). It goes on to say that table and point cuts were the most admirable—a statement surely slightly out of date by the time the text was written and thus perhaps repeated uncritically from an earlier text, although the writer was a practicing jeweler and lists jewelry made in 1670–71. That he also refers to buying diamonds brought from Goa by the Portuguese reinforces the suspicion that sections of earlier texts were copied uncritically. An inventory of the jewelry belonging to the Duke and Duchess of Marlborough, undated but presumably written before, or not much later than, the duke’s death in 1722, gives detailed descriptions of diamonds, noting weight, color, clarity, and sometimes even proportions. Examples include “A fine spread brilliant, the bottom very deep, drawing upon the blue” and “a high- crowned brilliant, good water, and perfect cleane” (Thomson 1839, 469–70). As Noël Antoine Pluche, an eighteenth- century French priest and natural historian, succinctly commented: “The size, clarity, shape, regularity of cut, good polish, which occasion the beauty and liveliness of play, are regarded with reason as the essential components to constitute the beauty, merit, and the price of diamonds” (Pluche 1748, 353). This sort of critical assessment must surely imply that magnification, as mentioned by Sir William Petty, was being used, but there is little clear evidence for this. Magnification has been known about for more than two millennia, as we saw in Chapter 1, but representations of jewelers or lapidaries employing it are very rare. In Alessandro Fei’s famous sixteenth- century painting *The Goldsmith’s Workshop*, in the Palazzo Vecchio, Florence, Italy, we see a goldsmith examining a gold ewer through a pair of looking glasses—we know he is a goldsmith, not a customer, because he holds a small hammer. Apart from that, I am aware of little else in a gem context until John Mawe illustrated a diamond cutter examining a diamond with a lens in 1823 (figure 11.5). Imitation Diamonds Imitations were a perennial problem. They are commented on in ancient India, a Roman example is shown in figure 2.8, and there were laws against them in medieval France. The early earring fragment from India in figure 3.6 contained both diamond crystals and rock crystal. Even royal jewels included fakes: there 228 • Value and Assessment of Diamonds are imitations in the so- called Bohemian or Palatine Crown in figure 4.7, jewelry at Edinburgh Castle in 1579 included a ring with “a counterfeit diamond,” and the “old jewels” taken out of the Tower of London in 1600 included “24 rings of gold set with mean diamonds and counterfeit diamonds” (Salisbury 1904, CP 82/2; Thomson 1815, 291). A gilded silver ring of thirteenth- or fourteenth- century date in the Victoria and Albert Museum, London, has a square pyramidal bezel that was surely intended to imitate a diamond (figure 11.6). The British historian Charles Oman refers to a similar ring in the museum at Tournai (Oman 1930, 66, cat. 241).² Prior to the development of synthetic or “lab- grown” diamonds in recent years, the counterfeits of the past, whether in enameled gold or in glass or some other gem material, were usually fairly easy to spot if you knew your subject. Glass, rock crystal, and white sapphire were the commonest fakes, the latter in particular since its hardness made it a plausible fake because it would easily scratch glass and so fool the more gullible. Heating a pale- colored sapphire would turn it colorless, making it a highly effective diamond simulant. Numerous recipes for this survive;

Wecker and Read in 1660 quoted no fewer than four taken from earlier writers (Wecker and Read 1660). A Jewish gem merchant writing in early fifteenth-century Venice mentions counterfeit diamonds in yellow sapphire, but assures us that an expert in diamonds could readily distinguish them (Sirat 1968, 1078–79). It was all about observation and experience. As Figure 11.6. A gilded silver ring with the bezel in the form of a pyramidal diamond, Western European, thirteenth or fourteenth century. Credit: Victoria and Albert Museum, London, 937– 1871.

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Archbishop Thomas Cranmer said, “Tell me I pray you, how a man without senses shall judge a true diamond? Put out his eyes, and is not a white sapphire, a diamond, and a glass all one in his judgement?” (Cranmer 1580, 276). Pliny’s misinterpreted statement that a diamond was strongly magnetic created a problem when it was taken as a test for a true diamond. Diamond is not magnetic. This was noted in 1660 by Wecker and Read in their *Secrets of Stones and Jewels*, which formed book twelve in their *Eighteen Books of the Secrets of Art & Nature*. They duly repeat the established wisdom that a magnet will draw a true diamond to it, then add: “But we can find no such experience in our dayes, unless it be so that all Diamonds be false” (Wecker and Read 1660, 232). The commonest and probably most ancient gemological test was the scratch test—a diamond would scratch any other gem, but nothing other than diamond could scratch a diamond. The optical properties of diamond could also be used to determine its genuineness. Thomas Nicols in the mid-sixteenth century seems to say that observation of the play of color of a diamond—its dispersion—was used by “the most judicious Jewelers [to] distinguish true Diamond from those of bastard kinds” (Nicols 1652, 46). However, the most sophisticated test is that given by Girolamo Cardano, an Italian mathematician, physician, and astrologer, in the chapter on gems in his extensive *De subtilitate* (Cardano 1560, 514). He says he learned this test from his friend the jeweler Hieronymus Guerinus (Jerome Guerin). The test is unclear, to me, but seems to be based on reflection, as viewed from point D in his diagram (figure 11.7) when the point of the stone is placed on a fingernail. A problem today is the treatment of diamonds to improve their appearance. Techniques range from radiation to laser drilling. For the student of diamonds in the past, these sophisticated modern treatments are not relevant, but simpler processes

Value and Assessment of Diamondscould still deceive. Benvenuto Cellini openly talks about placing a blue pigment behind a yellow diamond to give a green appearance, but this doesn’t seem to have been done with any intent to deceive. However, similar use of blue dyes behind yellow diamonds to improve their appearance was a big problem a century ago. Even earlier, in 1728, a widely reported news item in England said, “A certain Gentleman of the faculty of Physick, has discovered an Art of bringing any sort of yellow or discolour’d Diamonds, by a certain Chemical Process, to a Clearness as perfect as that of the first Water, without the least Detriment to them, in any other Respect. The first Experiment he made was upon a very yellow foul Diamond that he bought of a Jeweller for 50s. for which the same Jeweller had offered him 12 guineas” (see, for example, *Stamford Mercury*, 22 August 1728). At the end of the day, the assessment and pricing of diamonds comes down to honesty and experience. We can leave the last word to the fourteenth-century Indian mint-master and writer Thakkura Pheru: “Those who fix a high price for an inferior gem or a low price for a superior gem, due to arrogance or avarice, will become lepers” (Sarma 1984, 72).

Figure 11.7. Diagram of an optical test for diamonds, as illustrated by Girolamo Cardano in his 1560 *De subtilitate*.

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That India was the source of diamonds to the ancient, medieval, and renaissance worlds is clear from what has been said so far. Now it is time to consider the mines in India in more detail and see how, as the centuries unfolded, European

knowledge of the mines there changed from confused myth to practical firsthand acquaintance. The Valley of Gems In 1375 Abraham Cresques, a Jewish book illuminator from the 12th The Indian Diamond Mines Mediterranean island of Majorca, produced an atlas, soon acquired by King Charles V of France for the Royal Library. This extraordinary work, now known as the “Catalan Atlas,” is in the Bibliothèque Nationale, Paris. Among the wealth of illustration and annotation we see in the middle of India two men hacking at an animal carcass (figure 12.1). Behind them is a deep cleft in the mountains inhabited by serpents, and above flies a bird with meat in its beak. This scene is an early European depiction of the recovery of diamonds, based on a story even then a thousand years old. This is the legend of the remote and mysterious Valley of Gems, retold over the centuries with protagonists from Alexander the Great to Sinbad the Sailor. In essence, meat was thrown into the inaccessible and serpent-guarded valley of diamonds; birds picked up the meat with adhering diamonds and the diamonds were recovered from them or their nests. Marco Polo explains two methods. In one, the men shout loudly so Detail of figure 12.7. 233 Figure 12.1. Detail of India in the 1375 Catalan map showing two men about to throw meat into the snake-infested diamond valley. Credit: Bibliothèque nationale de France, Département des manuscrits, Espagnol 30. 234 • Indian Diamond Mines that “the eagles are thus frightened away” and they then “recover the pieces of meat, and find them full of diamonds” (Yule and Cordier 1993, 2:361). As an alternative, the men could search for diamonds in the eagles’ droppings or simply kill the eagles and recover the diamonds from their stomachs. The earliest mention of a valley of gems seems to be that by Epiphanius, Bishop of Salamis, in Cyprus at the very end of the fourth century AD, in his commentary on the twelve stones set in the high priest’s breastplate described in the Book of Exodus (Blake and de Vis 1934, 117–18). This work has survived, or did survive, in Greek, Latin, Syriac, Coptic, Armenian, and Georgian versions, although not all include the passage with the Valley of Gems. Epiphanius borrowed from earlier Greek and Roman writers, including Pliny, but there is no known earlier classical tradition of the Valley of Gems, and it is possible that it was some trader’s or traveler’s tale that had reached him from the east. Since Epiphanius had lived in what are now Egypt, Israel, and Turkey, such exposure is not improbable. The legend had also reached China no later than a century or so after Epiphanius (Laufer 1915, 6–8). Berthold Laufer discussed the Valley of Gems legend in detail and concluded that it “originated in the Hellenistic orient, and was propagated from this center to China, to India, to the Arabs and to Persia” (Laufer 1915, 20). Perhaps it is more likely that its origin lay a garbled understanding of some form of rite or sacrifice accompanying mining; indeed, flesh offerings to a giant snake near diamond mines were recorded in India in the late eighteenth century by Thomas Motte, as we will see later. Unlike some later writers, Epiphanius didn’t equate any of the twelve gems in the high priest’s breastplate with diamond. He didn’t mention diamond at all, but he does explain that the jacinth stone was found in a remote, deep valley in Scythia, to the north of the Black Sea or east to the Urals, not India. To retrieve the stones, men threw in lambs’ carcasses, to which the gems adhered. Eagles picked up the meat and carried it to their nests. Epiphanius reported that when the eagles had eaten their fill and flown off again, “the men come, collect the gems and clean them from the carcass which the eagles have brought up, take them away and hand them over to the kings who sent them thither.” By medieval times, the valley had gained the additional deterrent of venomous snakes, and the gems were typically identified as diamonds. In medieval Islamic versions, the snakes and diamond recovery were sometimes recounted as separate myths, but the hero was now Alexander the Great (Ruska 1912, 150; Said 1989, 81–84). Later, when there was an attempt to balance appealing old

myth with scientific exactitude, it was explained that Indian Diamond Mines • 235 whereas all the ancient diamonds in the world derived from the stones retrieved from the Valley of Gems by Alexander, there were now diamonds coming also from new mines in India (Bournoutian 2006, 457). One of the latest appearances of the story in Europe is at the beginning of the seventeenth century in the *Goulden Arte*, where William Heth places the diamond valley with its “venimus beasts” a precise fifteen days’ journey beyond the northeast Indian port of Cambay, modern Khambhat (Heth 1603, 62v). The Location of the Mines India’s fame as provider of diamonds was well entrenched in the medieval mind, established by persistent folklore and objective details from Pliny, Marco Polo, and numerous Muslim writers, including the twelfth-century, Sicilian-based geographer Muhammed al-Idrisi, who commented that India produced the diamonds with which the gems were engraved (Jaubert 1836, 71–72). However, disentangling the actual sources known in antiquity is tricky. Early Indian texts such as the *Arthaśāstra*, the *Ratnapariksa* of Buddha Bhatta, the *Brihat-Samhita* of Varāhamihira, and the *Garuda Purana* all provide lists of diamond sources, but seldom can the places they name be identified today. The *Arthaśāstra*, probably the earliest of these and likely compiled in phases between the later second century BC and the late third or fourth century AD, explains that gems were found in mines, streams, and other places (Olivelle 2013, 25–28). Much the same statement is repeated in the *Garuda Purana*, which, as well as showing how much the later text was reliant on the earlier, makes it clear that there was deliberate mining from an early period, not just fortuitous discoveries in rivers. 236 • Indian Diamond Mines

Figure 12.2. The main diamond-mining areas in India. Map: Jack Ogden. More recent centuries have seen extensive studies of the locations of the various diamond mines in India. A comprehensive account is *A Description of the Diamond-Mines* written in 1675, probably by the diamond dealer Nathaniel Chalmley, and reproduced in full here in the appendix. The nineteenth century was particularly productive, with investigations by such people as the Scottish surgeon and natural historian Benjamin Heyne (1814), German geographer Karl Ritter (1836), East Indian Company soldier and orientalist Thomas Newbold (1843), and Irish geologist Valentine Ball (1881a, 1881b, and 1889, 2:348–359). More recent authors have generally drawn heavily on Ball, but the possibility of modern commercial exploitation of Indian diamonds has prompted some new geological studies. As with the ancient Indian texts, the identities of the various mines mentioned in even quite recent publications are not always clear today. The spelling of place names has been erratic, political borders fluid, and some regional and other names have changed completely. For simplicity’s sake, the mines are considered here in three groupings: north, south, and what we might consider the “new” Golconda mines (figure 12.2). Indian Diamond Mines • 237

Only alluvial diamonds were exploited in India in ancient and historic times—that is, diamonds washed down from original primary deposits to remain in riverbeds or what had originally been riverbeds. As we saw above, early Indian texts refer to diamonds found in pits and streams, and Marco Polo added a more practical alternative to using eagles to bypass serpents in the diamond valley when he noted that plenty of diamonds were found in rivers (Yule and Cordier 1993, 2:360). The painting in figure 12.3 is taken from *Le livre des voyages de Marco Polo*, as translated by Robert Frescher (1475–1525) and now in the Bibliothèque Nationale de France. In addition to some ferocious serpents and rather docile eagles, we see on the right a naked man in a river. This presumably alludes to Polo’s mention of diamonds in rivers, and if so is perhaps the earliest representation of alluvial diamond mining. The Northern Group of Mines The northern diamond mining areas included what Jean-Baptiste Tavernier described as “the most ancient of all” and were a major source for the early

Mughal court. In the sixteenth century, Garcia de Orta, a Portuguese doctor practicing in Goa, noted that there were diamond mines “in the Deccan, near the territory of Imadixa (whom we call Madremaluco)” (Markham 1913, 345). These, de Orta says, were traded in “Lispor,” modern Achalpur. Buyers included Gujaratis who then sold them in the city of Vijayanagar (modern Hampi) far to the south. “Madremaluco” was presumably Fath- ullah Imad- ul- Mulk, and “Imadixa” the Imad shahi dynasty of Berar that Imad- ul- Mulk founded, with Achalpur as its capital. This ruler had died in 1504, some sixty years before de Orta published his work, so he apparently relied on older accounts. These diamond mines may well have been those some two hundred miles east of Achalpur

238 • Indian Diamond Mines at Vairagad on the Triveni River. Valentine Ball equated these with the diamond mine at “Biragarh” mentioned in the late sixteenth- century Ain- i- Akbari, which deals with the administration of the Mughal emperor Akbar’s empire (Ball 1881a, 37–39; Ball 1889, 2:35; Jarrett 1891, 230). These are presumably also the diamond mines at “Barakar” that Akbar’s successor Jahangir (ruled 1605 to 1627) planned to seize, but which were surrendered without a fight since “opposition to the victorious army” was unrealistic (Rogers and Beveridge 2003, 2:21–22). In his memoirs, the Tūzuk- i- Jahāngīrī, the emperor Jahangir observed that these diamonds “are superior in kind and beauty to all other kinds of diamonds, and much esteemed by jewelers. They are of good shape, and larger and superior.” Vairagad may also be the Vairagara source of diamonds listed in the Sanskrit Navaratnapariksa and some other early Indian texts, thus attesting to the antiquity of these mines (Finot 1896, xxv, 148). Figure 12.3. Diamond mining in India, showing the valley of eagles and snakes, and also alluvial mining (at right). Credit: From *Le livre des voyages de Marco Polo, 1475–1525*. Bibliothèque nationale de France, Ms- 5219 réserve 141r.

Indian Diamond Mines • 239 They may also be the diamond mines that the Persian historian Fereshta reports that Ahmad Shah I Wali (1422–36), ruler of the kingdom of Bidar, “possessed himself of” in 1425, since during that military campaign he spent a year at Achalpur, the old trading hub for the Vairagad diamonds (Scott 1794, 103). Ball suggested that the Albenigaras diamond mines mentioned by the fifteenth- century Italian traveler Niccolò de’ Conti might represent Vairagad (old Biragarh) with the added Arabic prefix “Al” (Ball 1881b, 134). As noted below, however, an equation with Bisnaga, one of the many old variant spellings of Vijayanagar, on the same basis is not impossible. The Mughal emperor Jahangir described how diamonds were retrieved from a river in the province of Khokhara (Khokhra), an early name for what is now Jharkhand, the East Indian state that includes the diamond mines on the river Koel some 160 miles southeast of Patna. Here, says Jahangir, among “the stones and sand” they found diamonds of all sizes, including the occasional large diamond “worth 100,000 rupees” (Ball 1881a, 25–26; Rogers and Beveridge 2003, 1:315). In 1616, on Jahangir’s instructions, Ibrahim Khan conquered the region, seized these mines where the locals “carry on work in the bed of the stream, and bring to Court whatever diamonds are found” (Rogers and Beveridge 2003, 1:316). The emperor recorded that one had been received with a value of 50,000 rupees and added that he hoped for many more to fill his jewel house. The mines in this area may equate with “Kalinga,” a source of diamonds mentioned in some early Sanskrit texts (Finot 1896, xxvi–xxvii). In 1766 Thomas Motte, superintendent of the police in Kolkata (formerly Calcutta), visited Sambalpur on the upper Mahanadi River, where he says diamonds were found in sands of one of its tributaries, the river Ib (Motte 1800). This was at the request of Lord Clive, who was keen to use diamonds as a way to send money to England. Motte noted, “The mountains abound

240 • Indian Diamond Mines with gold and diamonds; but the natives are deterred from working the mines by their indolence and fear of the Mahrattas, to whom their riches would only point them out as

more desirable prey.” For similar reasons the locals only searched riverbeds rather than looking for the source in the mountains. While in the area, Thomas Motte visited what he described as “the Naik Buns [Nagbansi], the great snake worshipped by the mountainous Rajahs.” This huge snake—from its track in the river mud, Motte estimated its diameter at “upwards of two feet”—lived in a cavern and was given offerings of goat and fowl. If, as likely, this was an extremely ancient practice, we may have an explanation for the origin of the legend of the snakes in the Valley of Gems. Tavernier said diamonds from “Soumelpur” were “all the beautiful points . . . but a large stone is rarely found there” (Ball 1889, 2:62–67). He added that stones from this area had not been seen in Europe for a long time because of the wars in the region. It is tempting to equate this “Soumelpur” as visited by Tavernier with the Sambalpur as visited by Thomas Motte. However, Ball has explained in detail why he preferred to identify Tavernier’s “Soumelpur” with a mine at Sumelpur or Soumelpor shown on older maps on the river Koel (Ball 1881a, 28–29; Ball 1889, 2:62–63n, 354–59). The distances Tavernier gives would indeed suggest that mines on the Koel were meant. Ball also proposed that the mine at Sumelpur equated with “Sambalaka,” which the ancient geographer Ptolemy said produced the world’s finest diamonds.¹ In his 1675 account of the diamond mines, the author, probably Nathaniel Cholmley, mentions mines in the hills “in and near Bengala [Bengal].” He explains that this barren, toilsome, and craggy country, to use his words, was left alone by the Moors, but the locals worked a few mines privately. This wording is reminiscent of Thomas Motte’s and may similarly have Indian Diamond Mines • 241 meant the diamond gravels of the upper Mahanadi River. However, the Ain- i- Akbari also mentions in Bengal “a place called Harpah in Madaran which there is a diamond mine producing chiefly very small stones” (Jarrett 1891, 125). This locality is uncertain, but one possibility is that Madaran was in the district of Hooghly just north of Kolkata in Bengal (Blochmann 1870). In the early part of the seventeenth century, Joannes de Laet, director of the Dutch West India Company, said that to the south of the Ganges was the territory of “Rahja Mugg” (Imad-ul-Mulk), who “is also said to possess a very rich diamond mine” (Hoyland 1928, 60). This could relate to one or more of the areas already mentioned. Early Indian texts also refer to “Paundra” as an ancient source of diamonds that Louis Finot, an archaeologist and director of the École Française d’Extrême- Orient, identified with Pundradeca, which encompassed the important and very early trading port of Tamralipta, believed to be modern Tamluk, some thirty miles southwest of Kolkata. This may have been a trading center rather than a mining area (Finot 1896, xxvi). The late sixteenth- century Ain- i- Akbari also says that “the peasants find small diamonds” some fifteen miles from the ancient fort at Kalinjar (Jarrett 1891, 159). These are the mines in the region of Panna. Ball records numerous mines in this region and says the earliest European to visit these was the Jesuit missionary Joseph Tieffenthaler in 1765 (Ball 1889, 2:351). Apart from the Ain- i- Akbari mention, little is known of the early history of these mines, but there was still diamond mining at Panna in the nineteenth century. A drawing made in 1867 (figure 12.4) shows the dire conditions of the workers, naked and up to their knees in water in a deep pit; practices may have changed little over the preceding centuries. This drawing may be based on an early photograph of a diamond mine.² 242 • Indian Diamond Mines The Southern Group The southern mines can be thought of as a group roughly bounded by Bellary, Kurnool, and Kadapa, thus along the banks of the Penna River and then northwest up to the Tungabhadra River and Raichur. Near the village of Jonnagiri, forty- four miles east of Bellary, there are rock- carved edicts of the emperor Ashoka of circa 250 BC. According to the Indian gemFigure 12.4. Diamond mines at Panna in the later nineteenth century by Jules Henri Jean Schaumburg. After Ball (1881a).

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ologists Jayshree Panjikar and K. T. Ramchandran, these refer to the gold and diamond mines in the area, and although I have not been able to confirm this from the archaeological literature, their presence here would suggest early exploitation (Panjikar and Ramchandran 2005). Going forward a millennium and a half, at the village of Anumpalle, some twenty miles to the southwest of Jonnagiri, there is a stele dated to 1336 that also mentions diamond mining (Panjikar and Ramchandran 2005). These diamonds were washed locally and then taken to the capital, what is now Hampi, just under a hundred miles away to the east. Early texts from the Ratnapariksha onward give Matanga as one of the eight main sources of diamond, and this was possibly in this region (Finot 1896, xxv–xxvi). The southern mines came variously within the kingdoms of Vijayanagar, Bijapur, and Golconda, depending on date; it was a time of war and borders changed. For example, as Valentine Ball pointed out, the diamond mines around Kurnool came within the Vijayanagar empire until 1564, when they passed to the Kutb Shahi dynasty of Golconda (Ball 1889, 2:352). Then in 1687 the area came into Mughal control when the emperor Aurangzeb conquered the Deccan. Thus, when in the mid-fifteenth century diamond mines were visited by the Venetian merchant Niccolò de' Conti, he describes them in terms of their distance from Hampi, capital of the Vijayanagar empire (Major 1857, 29–30). The mines were, he said, some fifteen days' journey north of Hampi on a mountain called Albenigaras. Here were venomous creatures and serpents, and thus men threw meat into the area that was picked up by eagles and vultures along with the adhering diamonds—yet another retelling of the Valley of Gems legend, but here associated with a specific mine. As noted above, the name “Albenigaras” may represent the Arabic article “al” added either to Vairagad (old Biragarh) or to Bisnaga, one of the many old variant spellings of Vijayanagar. In 244 • Indian Diamond Mines either case, it might reflect Arab involvement in the diamond mining or trading there. Several other Europeans mention diamond mines in the Bijapur (modern Vijayapura) kingdom. The Portuguese traveler and horse trader Fernão Nuniz in the 1530s mentions “Gate” as a place for supplying diamonds to the Hampi markets, probably modern Gooty, fifty miles east of Bellary (Sewell 1900, 388n7). The Goa-based Portuguese doctor Garcia de Orta said, “In Bisnaguer they [diamonds] are in two or three rocks which yield much to the King of Bisnaguer” (Markham 1913, 345). Another comment was by the Dutch merchant Jan Huyghen van Linschoten, who spent several years in India in the 1580s. He reported that any large diamonds found in these mines belonged to the king and that concealment was a capital offense (Burnell and Tiele 1885, 2:137). In 1675 the mines near Kurnool were among those described as being in the kingdom of Bijapur. The writer, probably Cholmley, describes fifteen such mines. One was Ramulconeta—that is, Rammalakota, also known in the past as Raolconda, less than twenty miles from south Kurnool. The detail of the ca. 1744 map in figure 12.5 shows Raolconda with the note that there were diamond mines in the area. Valentine Ball tried in vain to identify the location of the other fourteen of Cholmley's Bijapur mines but admitted defeat, saying, “I would venture to commend the identification of those mines which are unplaced in the above list to someone with local knowledge.” The mines around Rammalakota were described in some detail by Tavernier and described and mapped by Ball (Ball 1881a, 13–16 and map 1). Tavernier describes conditions at the mines, diamond cutting there, and foreign merchants visiting to buy diamonds, and notes that these mines were found two hundred years before his time—a comment Ball says may need to be taken with a pinch of salt (Ball 1889, 2:43). Ball suggests that a diamond mine described by the Venetian merchant Caesar Fredericke in the 1560s was also Rammalakota (Ball 1889, 2:76n). The distances given to the Rammalakota mine by Tavernier seem to be

underestimated; he says the Rammalakota mine was five days' journey from Golconda and eight or nine from Bijapur. The actual distances are about 160 and 230 miles by road, respectively. On the other hand, Fredericke's statement that it was a journey of six days from Hampi to the mines, a distance of about 130 miles, seems a bit brief assuming travel by ox cart, where one would expect an average of twelve to fifteen miles a day. Fredericke says that he was told that the mine was "a great place, compassed with a wall, and that they sell the earth within the wall, for so much a squadron, and the limits are set how deepe or how low they shall digge." He also says that any larger stones were reserved for the king, but not much was being mined because of "the troubles that have beene in that kingdome" (Hakluyt 1599, 348). The East India Company records from the 1620s noted that near Bijapur there was an old diamond mine that provided some diamonds and that these were bought by the Portuguese, although with little profit (Sainsbury 1884, 446). Nathaniel Cholmley knowingly remarked that while these mines are known to yield "Stones as large and good as those of Galconda," the king kept the best, and so while "Golconda is famous for the largeness of those [diamonds] it affords, Viliapore [Bijapur] is noted for the smallest." But not all mines yielded good stones for the king. As noted above, in September 1652 at Gandikota on the Pennar River, Mir Jumla, an important provincial governor under the Mughal emperor Aurangzeb, showed Tavernier five small bags of poor-quality diamonds. When Tavernier said there was no market for such diamonds in Europe, Mir Jumla explained that when he first contemplated the conquest of the region, he was told of the diamond mines and sent 1,200 men to 246 • Indian Diamond Mines work them. However, the five bags represented the total yield for the year, and so he stopped mining and "sent all those poor people back to tillage" (Ball 1889, 1:230). Mir Jumla was something of a diamond expert. Tavernier described how he showed him some gems, hoping to sell them to him, and Mir Jumla "examined them well" (Ball 1889, 1:229). The Golconda Mines The mines along the lower Krishna River are those usually thought of today as "the Golconda mines," even though the Golconda Sultanate (ca. 1518–1687) extended further to the south, encompassing some older mines along the Penna River (Ball 1881a, 16–24 and map 2). The term Golconda also applied Figure 12.5. Detail of A Map of India on the West Side of the Ganges, Comprehending the Coasts of Malabar, Cormandel and the Island Ceylon, by Emanuel Bowen, ca. 1744. Showing Goa (lower left) and the diamond mines of "Raolconda" (lower right). Credit: Antiqueprints.com. Indian Diamond Mines • 247 to the fort now in ruins just to the west of Hyderabad. The Figure 12.6. Detail of A Map of India on the West Side of the Ganges, Comprehending the Coasts of Malabar, Cormandel and the Island Ceylon, by Emanuel Bowen, ca. 1744. Showing Golconda (left of center) and "Diamond Mines of Coulour" (lower center). Credit: Antique prints.com. 248 • Indian Diamond Mines detail of the ca. 1744 map in figure 12.6 lacks accuracy, but encompasses Golconda (left of center) and Masulipatam (modern Machilipatnam) on the right. Here the Krishna River is labeled "R. de Coulour," and just above is the label "Diamond Mines of Coulour." This was Kollur, the most famous mine here (Cholmley's Qoulure), which seems to have been first discovered around 1619. Nathaniel Cholmley described it as "the first Mine made use of in this Kingdom." In the early 1620s William Methwold, an English merchant and East India Company administrator, visited and described a diamond mine that he says had recently been discovered in the kingdom of Golconda (Moreland 1931, 30–33). He notes it was four days' journey from Machilipatnam, not far from the Krishna River. This was almost certainly the Kollur mine (Ball 1889, 2:56n). Four days is a fair estimate of travel time by the usual ox cart. Andries Soury with the Dutch East India Company (Vereenigde Oostindische Compagnie— VOC) at Machilipatnam, who accompanied Methwold to

the mine, wrote to the directors at Amsterdam in January 1621 saying that some fifteen to eighteen months earlier a diamond mine had been discovered at a place about forty- eight to fifty miles from Machilipatnam (V OC 1073, fols. 156–59).³ An East India Company document dated January 1624 says that the mine had been found four years earlier (Foster 1909, 211). William Methwold described how after this mine's discovery, "Jewelers of all the neighboring nations resorted to the place" and that there were "no fewer than 30,000 souls working there." So crowded was the area that the best lodgings he and his companions could find near the mines was "a handsome hogstie." Soury says it was a very large mine, with extensive workings, employing almost 20,000 men (VOC 1073, fols. 156–59). Soury also tells us that the mine had been leased out by the king, but that all diamonds found there weighing more than eight carats had to be given to him. This meant that few diamonds over seven carats were brought to the market at Machilipatnam. Methwold described the working of the mine in some detail: "These mynes are not, as with us in Europe, carried under ground and supported with timber, but digged right downe in square large pits. Whether it be that all the earth affords more or lesse profit, whereas ours onely run in veines, or whether they want props, or judgement, to take this course, I cannot determine; but am sure that in freeing of the water, and bringing up the earth, they goe the furthest way to worke, for, in place of pullies and such like devices, they with many people setting [sitting] one above another hand up from one to another untill it comes to the place it must rest in; and from hence proceedeth the use of so many people, seeing that, besides the earth, the where over- night they wrought dry is next place mor ning a fathome deepe under water" (Moreland 1931, 32). This descrip

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Figure 12.7. A fanciful depiction of an Indian diamond mine by Romeyn de Hooghe, published by Simon de Vries in 1682. Credit: The Prints Collector. 250 • Indian Diamond Mines tion was repeated by de Laet, who notes that "sometimes few, sometimes many gems are found, and sometimes none at all, in which case the time and labor are wasted," and added some gratuitous comments, such as "these barbarians are almost ignorant of machinery" (Hoyland 1928, 75–76). Methwold further explains that the Kollur mine, at the foot of a great mountain not far from the Krishna River, had been a barren, inhospitable place, but, after the lucky discovery of diamonds there, was "peopled with a hundred thousand souls, consisting of myners, merchants and such others as live by following such concourses" (Moreland 1931, 33). An early depiction of an Indian diamond mine (figure 12.7), an engraving by Romeyn de Hooghe published by Simon de Vries in 1682, shows the hand- carryin g of the earth, but with an excess of artistic license and extras, including a multi- armed de ity (Vries 1682, 2: facing 946). This representation is perhaps based on Methwold's or de Laet's account of Kollur. This is not the earliest depiction of Indian diamond mines. In the 1570s the artist Tommaso Manzuoli decorated the walls and ceiling of the study of Francesco I de Medici in the Palazzo Vecchio, Florence. The representations included a diamond mine. This fanciful depiction has naked miners with their left arms tied behind their backs searching the ground and shallow pits, and similarly naked, but unfettered colleagues suspended by ropes on precipitous rocky crags. Perhaps surprisingly there are no serpents or eagles, and thus identifying this imaginative scene with diamond mining may seem far- fetched, but it w as so identified in the artist's lifetime (Borghini 1584, 540). T he discovery of the Kollur mine had two effects. A letter dated November 1621 announced: "Diamonds are much fallen in price by reason of the myne lately found" (Foster 1906, 327). Also, the Mughal emperor Jahangir's ears had pricked up at news of the mine and sent an ambassador, Abdul Aziz, to Golconda to claim the income from it (Foster 1906, 332, 208n). His visit was preempted. In August 1621, Methwold and others wrote: "The diamond

mine is shut up” (Foster 1906, 264–66). This closure is corroborated by Dutch documents and by Fernão de Albuquerque, the Portuguese governor of Goa (VOC 1074, fols. 286–87; 1076, fols. 389–392v). After a stay of four or five months, Jahangir’s ambassador returned to Jahangir having been given (or having purchased—there seems to be ambiguity here) some 150 to 200 diamonds weighing between thirty and fifty carats each (Prakash 1984, 207–8, 227; VOC 1076, fols. 402–402v). This certainly gives an idea of the mine’s yield. With the mine closed, diamonds became “both scarce and deere” in Machilipatnam (Foster 1906, 264–66). Soury says prices went up 35 percent, while English sources say they quadrupled (VOC 1073, fols. 170–71; Foster 1906, 264–66; Foster 1908, 334–39). For the rest of 1621 and through 1622 the mines remained closed, and Methwold and his compatriots talked wistfully of prospects “if the mynes open” (Foster 1908, 260). The mines finally reopened in early 1623, but the English complained that “there cometh fewe [diamonds], and them very small and deare and also fowle” (VOC 1078, fols. 390–93v; Foster 1908, 229). Both the English and the Dutch were urged by their respective trading companies to buy what they could, assuming prices were sensible, although the Dutch were told that such purchases shouldn’t be to the exclusion of buying slaves, which could also provide good profit (VOC 1076, fols. 94v96). However, since merchants were going to the mines to buy, fewer were being brought to the coast, so the Dutch sent a diamond merchant, Zackarias Malieux, with a diamond cutter to the mine to buy (VOC 1078, fols. 390–393v; Foster 1908, 229). The “gold rush” and general excitement surrounding the discovery of the Kollur mine in around 1619, and the impact its opening and then closing had on prices, support Nathaniel 252 • Indian Diamond Mines

Cholmley’s statement that it was the first mine opened in the region. The others—Cholmley lists twenty- three in total—were presumably opened after 1620, since he notes that they were “now employed, or have been so lately.” Dutch East India Company correspondence dated January 1621 says a mine had been discovered at “Bamimganne Pully” some three days’ journey from Machilipatnam (VOC 1072; fols. 175–80v). A 1623 letter from Machilipatnam back to Holland noted that a peasant had found two large diamonds while digging behind his house, while a letter of November 1640 mentions “Pallam, where the dyamond myne is,” although this Pallam has been not identified (VOC 1078, fols. 390–93v; Foster 1912, 264). In Cholmley’s day the most recently opened mine was at “Melwilllee,” which he calls the “New Mine,” first worked in 1670. The absence of diamond mining in the Krishna area before about 1619 is also indicated by two Dutch accounts of Golconda written during the previous decade, one by Antony Schorrer, the other probably by Pieter van Ravesteyn. Neither makes any mention of diamond mines in the region (Moreland 1931). Tavernier recites the story of the discovery of the first diamond at Kollur by a poor man digging the land to plant millet in the mid- to later sixteenth century, but perhaps not undue weight should be attached to this date or account (Ball 1889, 2:57). Methwold attributes the discovery to a “silly goatherd” (Moreland 1931, 30), and in the 1790s Benjamin Heyne visited seven of the mining areas and said that the mines at “Kodavatikall” on the banks of the Krishna (Cholmley’s Codawillicul) were discovered when it was noticed that a shepherd was lighting his tobacco with sparks struck from diamonds he had picked up (Heyne 1814, 92–107). The poor man was killed to ensure his silence after he had pointed out the source of the stones, and subsequently a “bullock load of diamonds” was said to have been found there. We will encounter such stories again when Indian Diamond Mines • 253

we come to the discovery of diamonds in Brazil and might well imagine the universality of such tales lies in some deep- seated human need to leaven the greed of exploration and exploitation with a mythical birth in innocence. There are few references to the diamond mines, or indeed the diamond trade, in East

India Company documents through the 1630s and 1640s other than the odd allegation of private trading and embezzlement. The wars in the region during the 1630s hindered trade (Foster 1910, 184). By the late 1630s, however, Golconda was a tributary to the Mogul empire, and it was now possible again for Europeans to travel to the diamond mines to buy. Initially the Dutch were in favor, but things begin to change for the English in the early 1650s. Walter Littleton with the East India Company at Fort St. George and the broker Venkata Brahman visited Mir Jumla, who ruled Golconda (Foster 1915, 12–13). Although formerly well disposed to the Dutch, Mir Jumla had “perceived abundance of pride and infidelitie” in them, so he now bore “a reall affection to the English” and wished to do business with them. Parcels of diamonds began to be sent to London in increasing numbers, so much so that in 1659 we hear of a glut of diamonds in England (Foster 1915, 147; Foster 1921, 20). As a result of this trade, London became a major center for diamond cutting. Cholmley noted that although the Golconda mines produced the largest stones, miners there could “dig away a considerable estate and find nothing.” In contrast, those mining at Vijayapura, though seldom realizing a fortune, could find many small stones and generally covered their costs, and most made some money. Other Europeans that visited mines in this area in the seventeenth century included the Bruges- born diamond merchant Jacques de Coutre; Sir Streynsham Master, an East India Company agent at Fort St. George; and the Dutch doctor Pieter de Lange (Hofmeester 2012; Temple 1911, 2:172–75; van 254 • Indian Diamond Mines Dam 1932, 176–81; Gommans et al. 2001, 313, 322). Most tantalizing are three “Manifests” in the British Library dated 1731. These are signed by Indian merchants who attest that a Mrs. Margaret Moses, with whom they were well acquainted, had “seen all of the diamond mines in this country” and “No[t] any Gentile Merchant having been to so many Mines” (BL Sloane 1968, fol. 54). Sadly, I have been able to find little else about this woman or her visit. Security, of course, was a perennial problem, with a constant battle of wits between those overseeing the mine workings and those hoping to purloin a gem or two. At the very beginning of the seventeenth century, William Heth reports how overseers searched the Indian miners “so near that they leave no so much as their privies partes unsearched” (Heth 1603, 63r). Over succeeding centuries when the Indian mines were all but forgotten and Brazil and then South Africa provided the majority of the world’s diamonds, similar problems and attempts at smuggling arose. Charles Boxer has described the subterfuges and security measures at the Brazilian diamond mines in the eighteenth century, showing that human nature and ingenuity are perennial (Boxer 1962, 204–25). India had been famous for its diamonds since classical times, thus encouraging, over the centuries, traders from the Armenian, Persian, and Islamic worlds, then Europeans via the hazardous overland routes, and finally, with the opening up of the direct sea route around 1500, the European trading companies. The mysterious Valley of Gems of legends gave way to the increasingly accurate descriptions of traders and travelers culminating in the comprehensive account on the mines probably written by Nathaniel Cholmley in 1675, which form the appendix to this volume, and his explanations of the day- to- day practicalities of the trade, which we will look at in the next chapter. Indian Diamond Mines • 255 The earliest depiction we have of a European diamond merchant in India is probably the frontispiece of the 1678 Amsterdam edition of Jean- Baptiste Tavernier’s *Travels* (figure 13.1). Here Tavernier and other well- dressed Europeans are shown being offered diamonds by the near- naked natives. Behind them is the mine, with miners at work, a hoist above. This Eurocentric bias makes it easy to forget that diamonds had already been traded in India for some two thousand years and that there were well established and sophisticated trading networks in place,

although few tangible records of these survive. The majority of gem traders within India were Indians themselves and, of course, Arab, Jewish, and Armenian traders had long been at the diamond mines and trading centers in India by the time Europeans gained a foothold toward the end of the medieval period. Indians, mainly Gujaratis, traded within India, seemingly less so outside until later, although Tjil Vanneste has recently noted with regard to the diamond trade that “in general the historical role of Indian trade networks in serving Asian markets remains undervalued” (Vanneste 2011). In the late eighteenth century, the navigator Thomas Forrest mentioned “merchants of Golconda,” perhaps Indians, selling diamonds to the Chinese in the Philippines—along with Sri Lankan traders selling sapphires and rubies (Forrest 1780, 320). Although Indians had built up a sophisticated trading network, work through Iran, parts of central Asia, and Russia by the early seventeenth century, diamonds do not seem to have been a part of this. The English traveler Anthony Jenkinson, who reached Bukhara (in what is now Uzbekistan) in 1557, found Indian merchants there but reports that they had brought no precious stones (Dale 2002, 24). However, some Indian diamonds were reaching Moscow in the 1670s, by way of the Dutch and Armenians (Romaniello 2012, 111). Ruy González de Clavijo in Samarkand in 1403–05 as the ambassador of Henry III of Castile at the court of Timur (Tamerlane), the founder of the Timurid empire in Persia and central Asia, says that diamonds reached Samarkand from China, a reminder that Marco Polo’s diamonds were supposedly obtained by him in China (Markham 1859, 171).¹ The part played by Jewish traders in the Indian diamond market prior to the seventeenth century is unclear. The Greek geographer Strabo in the first century BC had commented that it was hard to find a place in the world where Jews were not to be found. Ibn Kurradadhbeh, an early ninth-century Arab geographer, described Jewish merchants traveling from North Africa to India and even China, and others say much the same (see, for example, Gil 2004, *passim*). Diamonds are not specifically mentioned among goods they traded, but pearls are. Ceylon is described as having had a large Jewish community by the tenth century, and this must have been for the trade in gems and pearls. Once into more recent times, the Jews played a significant role in the diamond trade. The part played by Jews in the London trade has been mentioned, but there is also remarkable correspondence concerning the diamond trade between London Jews and Indians in Goa (Trivellato 2009). Jacques (or James) de Paiva of Portuguese descent moved from Amsterdam to London and then, in 1685, became one of the first Jewish merchants and diamond traders with permission to reside and trade in Madras in India (then known as Fort St. George). This move met with some concern. A letter from John Cholmley in England written in December 1685 notes that “Paive [de Paiva] had made an interest with Child [Sir Joshua Child of the East India Company] and is now going out to Fort St. George to buy diamonds for the Company which will certainly ruin the trade as to us and carry it wholly to the jewes.” De Paiva died just two years later in 1687 at Golconda, but not before his wife had become the mistress of the man who that same year became the governor of Madras—Elihu Yale, the founder of Yale University. This was just part of the scandal surrounding Yale. John Nicks went to India with the East India Company in 1668 and married Catherine Barker in 1680. He spent much time away from Fort St. George, and “Mrs Nicks then lived with Mr Yale at his garden house, which she and Mrs Paiva have and do frequent, to the scandal of Christianity among the heathens” (Cotton 1905, 11). Armenian traders had been present in India since antiquity and were trading diamonds and other Indian goods to the west, via their

entrepôt Aleppo. They had trading privileges in Venice, Livorno, and other Italian cities by the 1500s, about the time the Portuguese doctor Garcia de Orta mentioned the many Armenians in India, although he doesn't mention them specifically in the context of the diamond trade (Markham 1913, 351). The size of the Armenian diamond business in the 1500s is unknown, but Evelyn Korsch has noted that in around 1600, 86 percent of the European demand for raw silk was being met by Armenian merchants (Korsch 2014). Certainly by the mid- 1650s the Armenians were purchasing such a large quantity of diamonds in India that prices had escalated by 40 percent (Vanneste 2011). The arrival of the English and Dutch trading companies by no means displaced the Armenians or Jews from this business. As Korsch also notes, the European trading companies traded in kind not cash, leaving the diamond trade from India largely open to private traders, which in practice meant predominantly Armenians and Sephardic Jews (Korsch 2014). In his recent study of Armenian trading networks, Sebouh Aslanian has quoted an account roll in Venice dated 1673 whereby an Armenian agent, Agha di Matus of Tabriz, was given a consignment of diamonds of different grades in Surat and then traveled through New Julfa, the Armenian trading center in Iran, then Turkey and Europe, to Venice and ultimately Livorno, to sell them (Aslanian 2011, 74). The Armenian scholar Mesrobian Jacob Seth has noted various instances concerning Armenian diamond dealings in Surat, including a 1669 dispute relating to the joint purchase by two Armenians of a large diamond weighing about 140 carats (Seth 1937, 259–61). They wanted a fellow Armenian to arbitrate since they feared they would lose the stone if the governor of Surat heard of it. The Armenians were competitors of the Dutch and English trading companies, but could also work with them (Ivinson 2014). In 1688 the directors of the East India Company agreed to extend benefits to Armenian merchants, who, by trading their goods via London, would benefit England. One of the best-known Armenian diamond merchants were the Shahrmanians (or Scerimans) of New Julfa, recently studied in depth by Evelyn Korsch (2014). They were active in Europe, particularly Italy, by the mid-seventeenth century and were mainly involved in the diamond and colored gem business. As Korsch has noted, their commercial activities were operated on a clan basis, and they “were able to create a worldwide trading network that facilitated import and export transactions between Europe and Asia.” They utilized both the traditional land routes and the sea route between Goa and Lisbon. It was Diamond Trade in India • 261 an extensive network; they had business branches in Venice, Livorno, Rome, Amsterdam, Cadiz, Paris, Vienna, Moscow, Constantinople, Basra, Bagdad, Madras, and Myanmar. Their diamond business declined with the discovery of diamonds in Brazil in the 1720s. Of the Europeans, Italian traders seem to have been first to arrive in India, most famous being Marco Polo at the close of the 1300s, although he can hardly be classed as typical since he stayed in the east for the best part of a quarter century. When the Portuguese Vasco da Gama first stepped onto Indian soil in May 1498, after completing the earliest direct sea journey there from Europe, he was supposedly greeted by two Arabs speaking in the Genoese Italian dialect. The Portuguese colony in Goa was established in 1510 and over the subsequent decades became the primary hub for their diamond trade, as we will see. This market remained important well into the seventeenth century. Huybert Vissnich with the Dutch Trading Company at Masulipatam wrote to his directors in Amsterdam in 1621 explaining that too little capital was being invested in diamonds by the Dutch and English and that most diamonds were being sent to Goa, Ormuz, Aleppo, and Persia and Turkey (VOC 1074, fols. 292–293 v 23). Details of the day-to-day European diamond trade in India in the second half of the seventeenth century can be gleaned from various sources, including Jean-Baptiste Tavernier's account of his travels to India and the business he did there.

Tavernier, shown in Eastern dress in his portrait by Nicolas de Largillière (figure 13.2), made a total of six trips to India, traveling overland, where he bought and sold jewels, culminating in his selling to Louis XIV of France a group of diamonds that included the blue stone that became known as the French Blue and, later, the Hope Diamond (Ball 1889, passim; Ogden 2017). Tavernier was not the only gem dealer to sell diamonds to Louis XIV. Another was the Amsterdam jeweler David Bazu, mentioned above. In the 1660s Bazu sold Louis several diamonds, including one particularly large diamond which was probably that reputedly purchased by him in India for the then equivalent of £100,000, an extraordinarily high sum in those days (Ogden 2017). He financed this by borrowing, at 46 percent interest, half this amount from Armenians, some of whom accompanied him on his journey home as far as Smyrna (modern Izmir, in Turkey) “to receive their money.” Bazu was traveling back to Europe in the same large silk caravan as Tavernier, then on his sixth and final trip. A letter from Benjamin Lannoy, who was British consul in Aleppo, to Sir Heneage Finch, then Charles II’s ambassador to the Ottoman Empire in Constantinople (modern Istanbul), reports that on this return trip Tavernier had bought a large diamond for £7,000 from an Arab in Isfahan, perhaps the large blue diamond that later became the French Blue and ultimately the Hope. Tavernier’s sixth trip also resulted in a legal case he brought against the heirs of jeweler Daniel Chardin, who had also sold diamonds to Louis XIV. The details are recorded in a *Factum*, of which several copies survive (Ogden 2017). Tavernier had taken goods of Chardin’s to sell in Persia and India and was seeking repayment for costs he had incurred dealing with Ottoman customs.² Information about the English trade in diamonds in India is, of course, provided by the detailed East India Company records. The East India Company was an English company formed to trade with the East Indies that received its charter at the end of 1600. This was the first of such European trading companies to be formed. The Dutch East India Company (the VOC), chartered in 1602, has also left copious records. Less formal, but particularly useful for the practical details of trade, is the largely unpublished correspondence between the Cholmley brothers, Nathaniel and John. Nathaniel Cholmley arrived in India around 1665 and in 1667 was granted permission to “traffique in diamonds.” He was the East India Company’s accredited agent at Golconda for purchasing gems between 1674 and mid- 1679 (Temple 1911, 2:128n4). For several years, Nathaniel Cholmley in India supplied diamonds to his brother John in London. During the 1660s, the East India Company did not restrict the private trade in diamonds (Foster 1923, 188). Diamonds could be sent back to England with small charges for transport and customs, and at the sender’s risk (Foster 1923, 196; Sainsbury and Foster 1925, 16, 18, 66). Nevertheless, it was not an easy business unless, like Nathaniel Cholmley, you really knew the trade well. East India Company employees had low salaries and when they sought to make money with diamonds were liable to “be cheated 50 per cent, and they never the wiser” (Foster 1923, 183–84). In 1668 the East India Company agreed that Nathaniel Cholmley could reside at Golconda, where he could trade in diamonds and jewels, and also travel from place to place, but he should not engage in any other trade nor do anything prejudicial to the company. He also had to give an account to the company of the diamonds he sent to England (Foster 1927, 131; Sainsbury and Foster 1925, 423). He seems to have abused this agreement within the year (Foster 1927, 277). Perhaps not surprisingly, the company introduced restrictions on private trade in diamonds in 1670 and took the entire trade into their hands in 1671 (Fawcett 1954, 273; Foster 1955, 46). But they never stamped out private trade, and even the

governor of Fort St. George did little to improve things. In 1679 the company had suspected Nathaniel Cholmley of illegal diamond dealing and the then- governor Streynsham Master was asked to make the necessary enquiries. Master simply called all the factors Diamond Trade in India • 265 together and asked if anyone knew of any frauds—they all said no. Nathaniel Cholmley's last visit to the mines was in November 1681, and he left India in 1682 a rich man. The letter that sheds most light on the practicalities of business in India in the Cholmley correspondence is one written by Nathaniel to his "good and trusty Friends" Robert Freeman and Richard Browne in 1682 when he left India, advising them on all aspects as to how they might best trade in diamonds there (Cholmley 1664–93, fols. 0050–51 et passim). The first thing was to "procure an honest Servant to serve you." Cholmley recommended Vogjee Moodasee, one of the eldest and most knowledgeable and respected candidates. He spoke some English and like most of the main diamond dealers was a Banian. Banians, who take their name from banik, meaning "merchant," were predominantly high- caste Hindus. Vogjee lived at Rammalakota, called Ramalconeta by Cholmley, a mine in the kingdom of Vijayapura that was "the place for the procuring of Bort and Launall" and for small diamonds, "2 or 5 in a carratt." Although small, the diamonds from here were "generally of an excellent crystalline water, have a bright clear skin, inclining frequently to a pale greenish color, are well shaped, but few of them pointed ones." To avoid pushing diamond prices up by showing too much enthusiasm, buyers were advised to take things slowly and ask for samples. Nathaniel had paid Vogjee 2 percent commission for obtaining diamonds, presumably the going rate. Nathaniel also advises on other commissions, what pay servants expected and so on. Next comes a suggestion verging on the unethical. There were two types of weights used for diamonds, both confusingly called mangleens (various spellings are recorded). The "small" mangaleen was about 1.4 carats, the "great" mangaleen was about 1.9 carats. Nathaniel craftily notes that "No European ever bought and accounted by the great Mangaleen 266 • Diamond Trade in India but myself, and the merchants are rather inclined to sell by the small making an Advantage go by itt, as I have." Perhaps unnecessarily he points out, "It will be very necessary, that you get the Calculation betweene the Carett and the great Mangaleen perfectly in your memory." The equation of one mangaleen with 1.4 carats can be seen on invoices for diamonds consigned by Mathew Empson and Abraham Pluymer in Madra to Sir Stephen Evance, a goldsmith in London, in around 1700, where weights in both units are provided (British Library, Mss. Eur. D874). Tavernier also noted the distinction between the mangelin of Rammalakota, which he says was 7 grains (1.75 carats), and that used at Golconda and Bijapore, which was 5 grains (1.25 carats) (Ball 1889, 1:333, 2:69–70, 2:98–99).³ Despite his rather cavalier treatment of weights, Cholmley was meticulous in recording and segregating the diamonds as they were bought. His practice when buying was "to have severall little Baggs." He had "one Bagg for Stones of 1/5 of a Mangaleen, one for 1/4, one for 1/3, one for 1/2, for 3/4, for 1 Mangaleen, and so upwards as far as necessary." As he bought each stone or parcel, he put the stones in the relevant bag with "a Tickett specifying the cost of the stones or parcel." Then he entered into his accounts a record of the bags, noting the number of rough diamonds, their total weight, and total cost. Another letter in the Cholmley correspondence advises that when selling, parcels should contain varying weights of diamonds, presumably because they provided the buyer with greater choice (Cholmley 1664–93, fols. 0140–0141). Cholmley also urged his colleagues to learn the "language of the Moors" as soon as possible to get best advantage. A century earlier, Richard Hakluyt had advised the simpler expedient of taking "a trustie interpretour in the Eastern Arabian tongue" (Jones 1850, 171). Cholmley also notes that the diamond

merchants' custom was to charge 5 percent commission plus 2 percent traveling charges, including guards, Diamond Trade in India • 267 when you went to the mines, or just the 5 percent if the diamonds were purchased from those who carried them to the coastal markets. Once obtained, the diamonds in their little leather pouches were sealed in a wooden box and entrusted to the captain or purser of an East India Company ship heading back to England (Samuel 2003). The financial and contractual side of shipping and what happened once the diamonds reached England has been discussed in detail by Edgar Samuel (Samuel 1978–80; Samuel 2003). Like most who combined East India Company employment with diamond dealing, Nathaniel Chholmley was accused of various wrongdoings. One said he had “noe skill in Dyamonds.” His brother dismissed this as “meere malice,” and we today, appreciative of the information he provides for us about the day- to- day business of diamond- buying in India, are lik ely to dismiss it as sour grapes (Chholmley 1664–93, fol. 0137). Chholmley doesn’t say much about Indian diamond dealers, but for an insight here we have two descriptions that are remarkably similar, despite being written some two centuries apart. Tavernier describes meeting a poorly clothed Banian. The Banian offered some small rubies in rings and then, seeing that Tavernier was interested in better pieces, suggested a later, more secluded meeting. At this, the Banian removed his simple headdress and untwisted his hair to produce a rag in which was concealed a 48.5- carat diamond “of beautiful water.” Tavernier purchased it and later sold it to a Dutch captain for “a fair profit” (Ball 1889, 2:50–51). The second account is from an English doctor, Henry Moses, who wrote an engaging account of his sojourn in India in the early nineteenth century: “From him [the gem dealer] may be purchased the most costly gems; and though to all appearances a poor man, he will often, should you express a wish to purchase any of these aduſt playthings, 268 • Diamond Trade in India pull out from under his gown a dirty roll of linen, in which he has folded an amount of treasure that astonishes you, when spread out to view. Here is a bit of brown paper, with a dia. mond wrapped up in it, worth fifty pounds” (Moses 1850, 237). Indian Markets Diamonds could be bought at the mines or at markets that could be established at the major city in the region where the mines were situated, often the capital, or at coastal ports. For example, Tavernier bought diamonds at Rammalakota in the “Kingdom of Bijapur” and at the Kollur (modern Kolluru) mine “which belongs to the King of Golconda” (Ball 1889, 2:70). In 1624 it was noted that “Neare Vizapore [Bijapur] also an old mine doth affoord some, and the Portugalls buy of them.” Such purchase of diamonds at the mines could be official or unofficial. “Att the mines,” advised Chholmley, “you freely buy single stones of all sortes and small parcells.” But large stones were usually the prerogative of the ruler, leading some miners to give in to temptation and risk the dire penalties for theft. As Chholmley succinctly put it: “The wisest, when they find a great Stone conceal it till they have an opportunity and then with Wife and Children run away” (see appendix in this volume). An ancient glimpse of an Indian gem market comes in the Tamil classic *Shilappadikaram*, believed to have been composed in the early centuries AD (Krishnamoorthy 2011). Here Kovalan, the son of a wealthy merchant, visited Madurai, an important Indian trading city, as mentioned by several classical writers, including Strabo, Pliny, and the author of the *Periplus*. The Mediterranean goods brought to Madurai to exchange for gems and other eastern luxuries included dancing girls and wine. It was a dancing girl that diverted Kovalan from his marriage, and in his later attempt to patch things up, he and his Diamond Trade in India • 269 wife sought to raise funds to start a business by selling her anklet of pure and beautifully worked gold set with rubies and diamonds. He went to the jewelry and gem market, where he found “traders skilled in judging the quality of precious stones and dealing in diamonds of the prescribed standard of

quality which were free from the four faults crow's feet, black spots, holes and lines, which were of four different colors and which had an auspicious sheen." An early insight into what a modern diamond dealer would term "the diamond pipe line" is Garcia de Orta's description of how diamonds from the northern mines were brought to the market in Ellichpur to sell. Here many were purchased by Gujarati dealers who then took them to the market in Vijayanagar (modern Hampi), the huge bustling capital of the empire of the same name (Markham 1913, 345). De Orta was probably repeating a description of the situation around 1500, but the continued prominence of Gujarati in the trade is clearly shown by Nathaniel Chalmley's comment that "the Banians of Guzzerat, who for some Generations have forsaken their own Country to take up the Trade, in which they have had such success, that 'tis now solely engros'd by them; who corresponding with their Country- men in Surrat, Goa, Golconda, Visiapore [Bijapur], Agra, and Dillee [Delhi], and other places in India, furnish them all with Diamonds." The centers Chalmley mentions here were then the primary diamond markets and can be considered in turn. Surat in Gujarat was a major seaport, now the center of the Indian diamond- cutting industry and with a long association with diamonds. "Surastra" is given as a "source" of diamonds in some early Indian texts, including the Ratnapariksa (lit. "gemology") of Buddha Bhatta probably dating from the early centuries AD (Finot 1896, xxv). John Ovington, chaplain to the East India Company, equates this with the Sanskrit name for 270 •

Diamond Trade in India Surat, also probably the Saraostus of the first- century Periplus of the Erythraean Sea and which survives in the name of the Saurashtra region of Gujarat state (Ovington 1696, 129n). Surat was important in the English diamond trade until superseded by Fort St. George (Madras). In 1689 Ovington saw diamond cutting here and was offered large diamonds to buy, although under a veil of secrecy. He explained, "Those that dig the Ground are narrowly look'd to, and examin'd at their Departure, that nothing be privately convey'd or stole away; and yet they sometimes escape all Discovery, by slipping a Stone into their Mouths, or thrusting it upwards in their lower Parts, or by bribing of the Overseers. By this means we sometimes meet with large Stones very Valuable. Two I saw at Suratt, the smaller was a sort of Table Diamond, rated at Twelve Thousand Pounds; the other was larger and exceeded the Price of the other almost Eight Thousand Pounds. All Stones of such a Size are Royalties, and Sacred to the Crown; and whoever finds them, or wheresoever they are heard of, they are presently seized and taken for the use of the Mogul. Therefore the Owner of these Noble Diamonds solemnly engaged our Secresie, and bound us to Silence, before we were permitted a sight of them" (Ovington 1696, 199). Surat was also important to Armenian diamond dealers. The French Catholic physician Gabriel Dellon, who traveled to India in the late 1660s, noted, "Suratte is a place of great Commerce; Their Diamonds are brought thither out of the Kingdom of Golconda" (Dellon et al. 1698, 28). His contemporary and compatriot Jean de Thévenot says much the same, explaining that diamonds, rubies, and pearls were sold there along with "all the other pretious Stones which are found in the East" (Thévenot 1687, 17). Surat lay on the Gulf of Cambay at the head of which was the city of Cambay, modern Khambhat, an important trading center for the carnelian and agate Diamond Trade in India • 271 trade since antiquity—and the Cambaet mentioned by Marco Polo. Here, according to the fifteenth- century Persian historian Mīr Khvānd, diamonds were available along with other gems (Stevens 1715, 93). De Orta includes Cambay as a source of diamonds, and the Venetian traveler Caesar Fredericke refers to Portuguese merchants here, as well as diamonds among the goods being sold (Hakluyt 1599, 343). De Laet also says that the Portuguese traditionally frequented Cambay, whereas the English and Dutch frequented Surat (Hoyland 1928, 17–18). The differing preference must reflect the rise in

prominence of Surat after the late fifteenth century, when the Cambay harbor began to silt up. The Dutch East India Company established its first trading “factory” in Surat in 1612. Inland was Ahmedabad, the capital and one of the main seats of Mughal power after its conquest by Akhbar in the 1570s. The Mughals themselves were a major, if not the major, market for diamonds as well as other gems. According to de Laet in the seventeenth century, Ahmedabad was “almost as large as London” (Hoyland 1928, 19). Diamonds were to be had here, and indeed Tavernier records that in Ahmedabad he purchased a diamond of some 157 carats, which he had cut into a pear-shaped “rose” of 941/4 carats (figure 13.3) (Ball 1889, 2:98–99). The Mughal court there attracted diamond dealers and such intermediaries as Shantidas, whom East India Company documents describe as the Mughal emperor Jahangir’s jeweler, supplied the ruler and others, sometimes inciting the ruler’s wrath for favoring business with the latter.⁴

Goa Further south on India’s west coast (see the map in figure 12.5), Goa became the hub for Portuguese trade after it became a Portuguese colony in 1510, although their shipping of diamonds, sourced from Vijayanagara, Bijapur, and Golconda, only really grew later in the century (Boyajian 1993, 49–50, 68). The Englishman, probably Nathaniel Chalmley, who visited the Indian diamond mines in the 1670s and whose account is quoted in full in the appendix to this volume, noted that in about 1600, the “Currure” mine (probably Wajra Karur near Bellary, in Chalmley’s day part of Golconda), “the most famous of them all and most ancient,” yielded a large stone, and the lucky Portuguese finder “immediately returned with his Stone to Goa.” For a time, the Goan diamond trade, largely in the hands of New Christians, supplied a major proportion of the diamonds entering Europe. The value carried is unknown since many of the diamonds and other gems were not recorded officially, but on the basis of contemporary estimates, the economic historian James Boyajian suggests that the gems shipped from Goa in just one year—1613—may have been worth some two million cruzados in Lisbon (Boyajian 1993, 50). That works out at the equivalent of almost eight thousand kilos of gold. In 1636 the value shipped to Lisbon on just one carrack, the *Nossa Senhora da Saúde*, on behalf of twelve Goan New Christian merchants was about a quarter of this (Boyajian 1993, 217). From 1648 we have a description of Goa that says that there “is managed all the traffick for Diamonds, and other Precious Stones, which have made the Court of Madrid so pompous and full of Glittering” (Dillingham 1648). By this time, however, the rise in English and Dutch trade, and the Portuguese rebellion against the Habsburgs, meant that Lisbon was playing a greatly reduced role in the European diamond trade. A letter in the Chalmley archive seems to suggest that the Inquisition in Goa had some negative effects on the gem trade there in the 1660s (Chalmley 1664–93, fol. 0154). John Fryer described Goa as the only place of consequence in India retained by the Portuguese in his day, the 1670s and 1680s, and Goa and thus Lisbon retained some importance in the diamond trade into the eighteenth century. In 1725 the *Caledonian Mercury* reported that two ships from Goa had brought to Lisbon “a great Number of Diamonds” (29 October 1725). Goa was essentially a free port, and one can imagine a very cosmopolitan trade. A view of Goa in the late 1500s is shown in figure 13.4. Van Linschoten tells us there were Christian diamond traders in Goa, while John Fryer writes, “The great Traders of this Place for Diamonds are the two Martins, both Jews” (Fryer 1698, 183). The English exported some diamonds from there (Samuel 2003), but the involvement of the English, allowed as private diamond traders under East India Company rules after 1667, made the Madras–London trade increasingly important (Prakash 1998, 241–42; see also Boyajian 1993, 136). Golconda In recent

years, the name Golconda has taken on a nearly mythical status. Almost any fine quality of the right diamond type 274 • Diamond Trade in India and seemingly old that might be from India that comes on the market is liable to be garnished with the name Golconda and will be assured of a good price. In historical terms, however, Golconda could mean either the sultanate of that name, which included some of the most famous diamond mines, or the fort or “castle” of Golconda that is situated some six miles west of modern Hyderabad and was founded in 1512 as the capital of the Golconda Sultanate ruled by the Kutb Shahi dynasty. The king of Golconda’s palace lay within the castle. The old name for Hyderabad was Bagnagar, as seen on the map in figure 12.6. Bagnagar was a large city, the administrative capital of Golconda and a major commercial center. The French traveler Jean de Thévenot, who was in India in 1666–67, mentions the “many Rich Merchants, Bankers and Jewellers, and vast numbers of skilful Artisans” in Hyderabad and, in addition to Indian merchants, those from Persia, Armenia, Portugal, England, and Holland (Thévenot 1687, 97). Diamond trading took place in both the Golconda castle and Hyderabad/Bagnagar. Thévenot says, “I was at the castle [at Golconda] with a Hollander who bought a large diamond. . . . He bought another Figure 13.4. Goa, illustration from Jan Huyghen van Linschoten, *His Discourse of Voyages into the East and West Indies*, 1579–92 (color engraving), by Johannes Baptista van Doetechum the Younger. Credit: Private Collection. Photo © Luca Tettoni/ Bridgeman Images. Diamond Trade in India • 275

Figure 13.5. (right) The Great Table Diamond of over 242 carats seen by Tavernier in Golconda in 1642. Figure 13.6. (opposite) A view of Golconda as first published by Simon de Vries in 1682, from *La Galerie Agreeable Du Monde* (1730). at Bagnagar” (Thévenot 1687, 98). When Tavernier tells us he was shown a large diamond of just over 242 carats, the so- called Great Table (figure 13.5), when he was at Golconda in 1642, he presumably means in the fort. This, he says, “is the largest diamond I have seen in India in the possession of merchants” (Ball 1889, 2:98; Balfour 2009, 81–85). Nathaniel Cholmley explained that at Golconda, as at Vijayapura, there was an open market for diamonds and that the late deceased “Abdul Cutopshah” (Abdullah Qutb Shah, 1626–72) paid well for large stones, but that his successor Abul Hasan Qutb Shah (reigned 1672–86) showed more interest in female dancers and magicians. Thévenot confirms Abdullah Qutb Shah’s love of important gems—what he termed “Stones of consequence”—while his successor’s foibles are shown in a rather candid depiction of the castle of Golconda (figure 13.6), as first published by Simon de Vries in 1682, but here taken from its reproduction in the 1730 *La Galerie Agreeable Du Monde*. We see Abul Hasan Qutb Shah on horseback by the castle walls. The captions identify the king’s courtesans and the “pleasure house of his women.” Lower left is a “Jesuit violated,” while to the right, elegantly attired Dutchmen look on. Some diamonds may have been bought directly at the Golconda mines, but not all diamonds bought at the Golconda castle were necessarily from the Golconda mines. Thévenot explains that although the Golconda mines brought great revenues to the king of Golconda, “His chief mines are in Carnates 276 • Diamond Trade in India [Carnatic region] in divers places towards Viziapour, and he hath Six thousand Men continually at work there, who daily find near three Pound weight, and nobody digs there but for the king” (Thévenot 1687, 102). Vijayanagara The ruins of the capital of the Vijayanagara kingdom, also called Vijayanagara, can be seen at modern- day Hampi some 17.5 miles east of Goa (figure 13.7). It was a huge and vibrant city, and its population in the sixteenth century has been estimated at half a million inhabitants, probably around twice that of London during the same period (Barbosa 1866, 213). The city had long been a trading center for diamonds. According to a carved inscription dated 1336, diamonds from mines in an area called Vajra Bhandar were brought to the city of Vijayanagara for

sale (Panjikar and Ramchandran 2005). This suggestion of an ancient open market for diamonds is supported by the Timurid chronicler Abd- al- Razzāq Samarqandī, who visited in the 1440s and says that “the jewellers sell publicly in the bazaars pearls, rubies, emeralds, and diamonds” (Sewell 1900, 90). As noted above, Garcia de Orta tells of diamonds being traded in Vijayanagara, including diamonds from the northern mines brought by Gujaratis. He also reports being shown several large diamonds in the city, including one the size of a small hen’s egg. His contemporary and compatriot Duarte Barbosa similarly tells us that diamonds were traded in the city and that the streets “were filled with an innumerable crowd of all nations and creeds; for besides many Moorish [Arab] merchants and traders, and the Gentile [Hindu] inhabitants of the country . . . an infinite number of others flock there from all parts, who are able to come, dwell, trade, and live very freely” (Barbosa 1866, 85–86). Another Portuguese traveler, Domingos Paes, visited Vijayanagara in the 1520s and described the city: “Going forward, you have a broad and beautiful street, full of rows of fine houses and streets of the sort I have described, and it is to be understood that the houses belong to men rich enough to afford such. In this street live many merchants, and there you will find all sorts of rubies, and diamonds, and emeralds, and pearls, and seed- pearls.” The diamond trade was particularly important, as Paes said: “In this city you will find men belonging to every nation and people, because of the great trade which it has, and the many precious stones there, principally diamonds” (Sewell 1900, 255–56). Later in the sixteenth century, in 1585, the London merchant Ralph Fitch fled from Goa and arrived in Vijayanagara, which he calls Bellargan, “where there is a great market kept of diamonds, rubies, sapphires, and many other soft stones.” However, by his time the kingdom had been conquered and the city was in decline, and indeed Fitch then traveled to Bijapur, a “very great town, where the king doth keep his court.” The image of a happy, cosmopolitan life at Vijayanagara provided by some observers is in contrast to the political shenanigans going on. At this period, according to the Victorian historian James Talboys Wheeler’s characteristically imperialist account: “The Hindu court [of Vijayanagar] was distracted by a series of treacheries, assassinations, and butcheries, equally revolting and bewildering. It would be tedious to unravel the story” (Wheeler 1880, 94). Bijapur may only have become an important diamond trading center after the 1560s, following its conquest of Vijayanagara. A comment in the Rajsagarisuri Nirvanrasa of Tilaksagar, dating to the 1660s, says that Bijapur was then both a diamond mining and trading center (Mehta 1991, 96). Nathaniel Chalmley notes Diamond Trade in India • 279

Figure 13.7. The Vithala temple and pillared market in Hampi, built in the sixteenth century. Credit: Muthuraman Vaithinathan/Alamy. 280 • Diamond Trade in India that although at the mines all diamonds over a certain weight were supposed to be sold to the king, in Bijapur there was an open market, and that the previous king, “Edelshaw,” presumably Ali Adil Shah II (1657–72), not only “would give very high prices for large stones” but rewarded the sellers with horses and other valuable gifts. Other Markets We know little about diamond trading at Agra and Delhi, other than that the Mughal court at Agra was a buyer of good stones. Numerous other places are also cited as “sources” of diamonds. Barbosa refers to diamonds being traded at “Calicut” and Malabar. Calicut, now known as Kozhikode, is on the Kerala coast and was a major ancient trading port visited by European, Jewish, Arab, and Chinese traders. A report of a Dutch voyage to India in about 1603 explained how, along the Kerala coast, the locals came aboard to trade pearls, rubies, sapphires, and diamonds; the writer warned: “goe not ashoare to trust them.” In the first century AD, the Periplus notes that “all kinds of precious stones,” including adamas, could be traded from the ports of Muziris and Nelkynda, both probably in Kerala,

southern India (Casson 1989, 84–85, 223). Another ancient “source” of diamonds in Sanskrit texts is Sopara (with variant spellings), which is presumably the ancient trading port of that name on India’s west coast, now a suburb of Mumbai (Finot 1896, xxvi). Later, there must have been some diamond trading activity in Mumbai. In 1675 the Portuguese viceroy in Goa, Luiz de Mendonça Furtado de Albuquerque, prohibited the Goa diamond dealers from dispatching or selling any diamonds to the English, but the dealers simply offered to take the diamonds to the English further north up the coast, in Mumbai (Fawcett 1936, 117, 165). Marco Polo says that in his day the only supply of diamonds was in the kingdom of Mutfili (Yale and Cordier 1993, 2:36062). These were perhaps diamonds traded from inland to the once important port, now insignificant village, Motupalli on the coast some seventy miles southwest of Masulipatam and the nearest eastern seaboard port to the diamond mines around Raichur. The earliest East India Company presence in India was at Masulipatam some three hundred miles north of Chennai (Madras), where the first “factors” were put ashore in 1611. This remained the East India Company headquarters in India until 1641 when it was relocated to Fort St. George (later known as Madras, then Chennai). Even then Fort St. George was second in importance to the English “Factory” at Bantam in Java until it was raised to a Presidency in 1652. It lost this status three years later, but regained it in 1684. An early eighteenth- century Diamond Trade in India • 281 account noted that when the English first settled at Fort St. George, the town “seemed by Nature designed only for fishermen, and the country for Shepherds.” But its importance grew, and it soon showed “a prospect of Inclosures and Avenues, green Walks, broad shady Trees, and flowry Gardens” (British Library MS IOR/G/40/26). The Russian traveler Afanasy Nitkin had spent several years in India in the fifteenth century. He mentioned the diamond mines at “Rachoor” (the Raichur area) and noted that there were three hundred diamond dealers then residing at “Kooroola” (Major 1857, 21, 30). Unfortunately, the identity of his “Kooroola” is uncertain. It probably equates with the Kolluri of the early sixteenth- century J awāhir- Nāma s since both place it near “Gulbarga”—modern Kalaburagi—and say that carnelian was worked there (Digby 2008). Diamonds could be purchased in Kalaburagi, and sold to Europeans for a large profit (Digby 2008; Bournoutian 2006, 458). Other identifications of Kooroola, such as with Kerala or the diamond mine at Kollur, seem unlikely. Kerala was far down on the western coast, and the Kollur mine was probably not discovered until later. Another possibility is the mine at Wajra Kurur. The accounts of Europeans such as Tavernier and Cholmley provide us with a good idea of the trade in diamonds in India in the 1600s, and of the quantities being mined. Our knowledge of earlier periods is far sketchier. Nitkin’s report of three hundred diamond dealers at Kooroola, even if an exaggeration, shows that there must have been significant mining and a significant market for diamonds in fifteenth- century India. Part of this must have been a home market. The thirteenth- century Persian writer Mohammed ben Mansur said that the export of diamonds had formerly been forbidden, indicating considerable home demand (Hammer 1818, 132). That huge stores of diamonds had been built up in India is shown by Nitkin’s de282 • Diamond Trade in Indiascription of the “immense quantity of precious stones, sapphires and diamonds” seized by the Moslems in their fights against the Hindus (Major 1857, 26). He adds that “Melikh Tuchar [Mahmud Gawan, known as Malik al- Tujja—‘king of merchants’] gave orders that none of them should be sold to foreign traders,” again indicating a desire to keep diamonds in India— and proving that foreign traders were hoping to buy. Thus, it is likely that the Indian diamonds entering the European trade in the seventeenth century were not all freshly mined. The French jeweler and traveler Augustin Hiriart, who was in India in the second decade of the

seventeenth century, commented of Jahangir that “as for diamonds, he has more than all the princes of the world put together” (Frémont 1990). William Hawkins, “Lieutenant General” of the third East India Company voyage to the east, was more specific, estimating that the treasury of the Mughal emperor Jahangir at Agra included 82.5 pounds (just over 137,000 carats) of uncut diamonds of all types, but none under two and a half carats (Foster 1921b, 102), untold riches for then. As a comparison, the Orapa diamond mine in Botswana produces around 12 million carats per year, but most well under 2.5 carats.

Diamond Trade in India • The explorer and writer Sir Richard Burton asserted that diamond cutting originated in India and “a little before the fourteenth century drifted, like the cholera of modern days, west” (Burton 1869, 106n). The development of cutting in India will be covered in this chapter. Burton seems about right in his chronology, and there is some evidence for early cutting or at least polishing, in India. Also, of course, determining where diamond cutting originated depends on what we mean by diamond cutting. As we have already seen, there are different ways to modify a diamond, and these developed at different times and possibly in different places. The Cutting Stages Ignoring the lapidary use of diamond—that is, using diamond chips for drilling and engraving, and diamond powder for polishing them—we can distinguish:

- Cleaving (splitting) diamonds
- Bruting, which is rubbing two diamonds against each other to smooth edges or to adjust shape
- Polishing the faces or edges of a diamond crystal or cleavage fragment by rubbing it on a fixed flat surface with diamond powder abrasive
- Polishing a diamond on a scaife (a flat, rotating cutting wheel fed with diamond powder)

Detail of figure 14.3. Pounding diamond into chips for drilling and engraving was almost certainly an Indian innovation and seemingly practiced by the mid-first millennium BC. That diamonds cleave in certain crystallographic directions must have been noted first when such diamond chips were being produced. I am unaware of any use of unpolished cleavage fragments in jewelry, however, and thus the intentional cleaving of diamonds served little purpose before polishing was developed. The same is true of bruting. The production of diamond powder is likely to have been an Indian invention, a natural lead-on from the production of diamond chips, and an Indian origin for colored gem polishing using diamond powder seems almost certain. This technology had certainly reached the medieval Islamic and European worlds by around AD 1000–1250, and earlier use there and in India would not be unexpected. It is easy to imagine that slight polishing to improve the appearance of a natural diamond crystal was also first attempted in India. India was, after all, the source of diamonds. It is uncertain whether more drastic improvement or modification of natural or cleaved diamond surface by rubbing on a smooth, flat surface with diamond dust was undertaken in India prior to its introduction further west. The crank- and- drive diamond- cutting wheel was almost certainly a fifteenth-century European invention, and what we can determine of diamond cutting in India and the regions on the trade route lands between there and the Mediterranean tends to reinforce this view. Turkey and Egypt

The earliest diamond cutter I am aware of in Ottoman Constantinople is one noted as being of Egyptian origin and registered in the city during the reign of Selim I (reigned 1512–20)

- Diamond Cutting in India (Atil 1987, 117). However, Venetian merchants had been active in Constantinople and Alexandria for several centuries by then, so if there had been cutting prior to the sixteenth century, it may well have been introduced from Europe. By the late seventeenth century, cutting was well established in Constantinople, and Evliya Efendi, who trained as a goldsmith there, reported that there were forty-five diamond cutters in the city (Efendi 1834, 192). For a cutter of Egyptian origin to be in Constantinople by the early 1500s implies that diamond cutting existed in Egypt,

presumably Alexandria, prior to this. The move of a diamond cutter from Egypt to Constantinople might relate to Selim I's conquest of Egypt in 1517. Or it might tie in with the decline of European mercantile interests there after the opening up of a direct sea trade between Lisbon and India by the Portuguese a decade or so earlier. The rise in Portugal's prominence in the diamond trade may have led to an influx of those involved in the diamond industry from Alexandria. Gem specialist Wallis Catelle said, with regard to Jewish cutters in Lisbon, that "Their forefathers are said to have come originally from Alexandria," but he provides no reference for this statement (Catelle 1911, 118; Heertje 1936, 12). Even if there was established diamond cutting in Egypt prior to the fifteenth century, it may well have been introduced by Europeans since the city had long- established Venetian, Genoese, and other European traders. Syria and the Levant Further east we might expect to find diamond cutters in major centers such as Aleppo in Syria by the later medieval period. However, there are no Arabic sources to my knowledge that mention the cutting of diamond there prior to the period at Diamond Cutting in India • 287 which diamonds were being cut in Europe. An Englishman, Peter Biddulph, "Lapidarie and Diamond cutter," was in the Levant in the first decade of the seventeenth century, perhaps at Aleppo, and he probably wasn't unique (Osborne 1745, 763). Aleppo was then a huge trading entrepôt, bustling with Venetian, Armenian, and other merchants, including diamond dealers, but there is sparse evidence for diamond cutting. We know of an Armenian jeweler, Murad Sargis k'ahana Halepts'i (1592–1662), who "polished and set precious stones, and buys and sells them in Aleppo," but diamonds were not necessarily among those (Bournoutian 2006, 455). The *Jawāhir- Nāma* (Book of stones), a treatise on gems of the early sixteenth century, describes the sale of Indian diamonds "to the Europeans in Syria" and comments that "there are none in the habitable world other than Europeans who have skill in the cutting of diamonds" (Digby 2008). This might suggest that European diamond cutters were present in Aleppo then. One of Arake'l of Tabriz's chapters on gems in his seventeenth- century History, derived in part from the *Jawāhir- Nāma*, similarly explains that only Europeans understood how to polish diamonds and reported those of Aleppo in Syria as saying that diamond was no use unless polished (Bournoutian 2006, 459). The original text was the *Jawāhir- nāma- i Humāyūnī*, composed in 1527 by Muhammad Ashraf al- Husaynī al- Rustamdārī and dedicated to Humayun, the son and heir of the Mughal emperor Babur. A mid- nineteenth- century copy of this text is in the British Museum (Rieu 1883, 995–96). There is also an abbreviated version in the British Museum as well as the copy cited above, studied by Simon Digby (Rieu 1881, 789–90; Digby 2008). 288 • Diamond Cutting in India Iran The situation regarding early diamond cutting in Iran and central Asia is tantalizing. There is a group of gold necklet or belt elements of about the fourteenth century in the Khalili collection, probably from Iran or the northern Black Sea coast (Spink and Ogden 2013, 2:422–23, cat. 319). Two of these ornaments are shown in figure 14.1. Some of these ornaments are set with small blue glass cabochons of sapphire color (shown at right) and these are intended, presumably, to imitate the little sapphire cabochons well known in medieval jewelry. The other mounts are set with small "square- cut" pieces of colorless glass in exactly the form of simple table- cut diamonds (shown at left). Colorless glass doesn't look its best in a gold setting, and it is difficult to explain this choice of color and shape unless the inlays were intended to imitate the appearance of table- cut diamonds. If so, do these imitation diamonds imply the use of genuine table- cut diamonds in the region at that period, or were they just local copies of what were in use further west, or in India? When the French jeweler Jean Chardin, later Sir John Chardin, described lapidary workers there in the late seventeenth century, he explained how they used bow- powered

equipment and commented, “It is difficult to make very straight a Stone that way” (Penzer 1927). This type of bow- powered cutting wheel was the same as that traditionally used in India (figure 14.2). Chardin made no specific mention of diamond cutting in Persia. Indeed, a lack of such craftsmen at the time is indicated by the request of Safi (Shah of Iran 1629–42) to King Charles I in England to send a diamond cutter, and a similar request of Suleiman I (Shah 1666–94) to Charles II (Matthee 1998, 236). In the 1670s Anthony Munster, a Dutch diamond cutter who had set off to work in Moscow, was taken to Isfahan as a slave, but it is unclear if he was expected to work at his craft there (Struys and Diamond Cutting in India • 289).

Figure 14.1. Two elements of a belt or necklace from Iran or the northern Black Sea coast, fourteenth century. The one on the left is set with table-cut colorless glass, that on the right with cabochon sapphire-blue glass. Credit: Nasser D. Khalili Collection of Islamic Art, JLY 1639. 290 • Diamond Cutting in India Morrison 1684, 114, 314). He escaped following mistreatment when he refused to convert to Islam, but died soon after. When the English merchant Jonas Hanway recounted his travels in Iran in the 1740s, he observed one of the Shah’s sets of horse trappings set with diamonds, “most of which were so prodigious a size as hardly to merit belief; for many of them appeared as big as a pigeon’s egg. I could not but regard them with wonder, not for their immense value, than for the barbarous taste in which they were set; for some of them did not appear to have any art bestowed on them.” He commented that “jewels in Europe appear incomparably brighter and neater set; and that if his majesty would trust me with one of those bridles, I would procure a complete horse-furniture to be made in Europe” (Hanway 1753, 255). The Shah replied that he “has not patience enough to wait till it should be finished.” When the *Gentleman’s Magazine* cited this story some years later, it prefaced it with the note: “It is well known that diamonds are cut to perfection in Europe only.”¹ Either the Iran diamond-cutting skills were none too impressive, or the diamonds were typical Indian-cut stones. However, cutting seems to have been established in Iran by the end of the eighteenth century. In 1792 the French diplomat Pierre Joseph de Beauchamp said, “It is unnecessary to mention those [arts] in which they [the Iranians] excel, as they may be seen in Chardin, but it may be proper to mention the new ones which they now have; as enamel, which they execute with great delicacy, and the cutting of diamond” (Beauchamp 1792).

Early Cutting in India When we turn to India, we have the benefit of several early texts that describe diamonds at length, but it is not always possible to interpret them with certainty. In his study of Indian lapidaries, Louis Finot described a section of the *Ratnaparīksā* of Buddha Bhatta, which may date to as early as the sixth century and which itself was derived from earlier texts, as saying that before being mounted, diamonds underwent an operation called *parikarman*, which made use of diamonds of too poor a quality for ornamental use (Finot 1896, xxx). However, the translation he provides alongside the relevant text far more mundanely

Figure 14.2. A gem cutter, Patna, India, ca. 1826. Credit: Victoria and Albert Museum, London, IS.48- 1964. Diamond Cutting in India • 291 says (my translation from his French): “The wise should not use for adornment a diamond that has a visible defect. It can only be used for polishing gems.” Finot translated the Sanskrit *parikarman* as “polishing,” although the word usually means something like “preparation” or “cleansing.” The passage is still deemed problematic by Sanskrit scholars, but it seems likely that the *Ratnaparīksā* says nothing about diamond powder being used to polish diamond, simply that poor-quality diamonds were employed for working other gems. Whether this implies the use of diamond powder for polishing colored gems or just drilling or engraving is uncertain. A reference to diamond cutting has also been said to be found in the *Agastimata*, a work of uncertain date written by the Indian sage Agastya.

One paragraph seems to mention cleaving a diamond, but it is highly ambiguous, apparently saying that the virtue of a diamond will be reduced if one strikes it like a nail with a deadly instrument (Finot 1896, 87–88). Another passage in this text appears more specific. In Finot’s opinion, this says that diamond cannot be cut with metals or other gems, but “diamond is cut by diamond” (Finot 1896, 78, 90). However, the Sanskrit word translated by Finot as “cut” is *bhidyate*, which has a range of meanings, the overall sense of which includes “alter,” “win over,” “split,” and “break.” Perhaps the best that can be said of this Sanskrit text is that it provides a possible reference to the awareness that one diamond could scratch or abrade another. The latter had been recognized earlier in the *Garuda Puranam*, a Sanskrit book probably written during the period of the Brahmanic revival in the Gupta period in the fourth to fifth centuries AD (Dutt 1908, i– iii, 186). Here the statement is included in a section on imitation diamonds and their detection because the knowledge that a true diamond can be scratched only by another diamond was important for a gemologist.

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The date of the *Agastimata* is uncertain. When Thakkura Pheru wrote his *Rayanaparikkha* (Gemology) in 1315 he noted, “In olden times, manuals on gem-testing were written by Brhaspati, Agastya and Buddhahhatta,” so at least part of the *Agastimata* was old then. Its appendix appears less ambiguous. It says (again from Finot’s French translation): “The stone [diamond] that is cut with a blade or by repeated friction becomes useless and loses its beneficial properties” (Finot 1896, xxx–xxxi, 139). This sounds like diamond cleaving and polishing, but this appendix is possibly a later addition. Berthold Laufer concluded that it fell “within the time of the Portuguese era of India”—that is, post-1500 (Finot 1896, xxxi; Laufer 1915, 48). The inscriptions in the central shrine in the Tanjavur Temple in southern India of about AD 1000, mentioned in chapter 3, might point to some diamond polishing if not more sophisticated cutting in Medieval India (Hultzsch 1891, 40, 81, and *passim*). These describe the various diamonds set in the donated gold jewelry as crystals, smooth diamonds, square diamonds with smooth edges, flat diamonds with smooth edges, and round diamonds (Hultzsch 1891, 40, 81, and *passim*). Indeed, the Sanskrit *agastyasamhita*, probably no earlier than the twelfth century, includes descriptions of two tools which have been suggested to be for working of diamonds. The *chedanavājra* was “a diamond with a notched cutting edge attached to the drill and used for grinding the diamond to the desired shape” (Singh 2006, 403–4). This might refer to bruting of sorts, although it may simply have meant some sort of tool for grinding other gems to shape. However, the *upamārajanavājra* was a “tool with a smooth surface and used for polishing diamond” (Singh 2006, 404). In view of the lack of mentions of diamond polishing in other Indian texts, a smooth surface used in conjunction with diamond powder for polishing other gems might be meant here. However, the possibility remains that we have

293 evidence that the polishing of diamonds in India by the twelfth century—a date that would fit in well with the earliest diamond cutting in Europe. Thakkura Pheru in the early fourteenth century said that diamond can cut diamond. This might refer to diamond cutting, but, again, may just have meant that Pheru knew that a diamond could be scratched by another diamond (Sarma 1984, 51 §36). He specifically noted that diamonds could not be ground on the traditional Indian lapidary wheel, and it seems likely that if he was aware they could be cut in other ways he would have said so. Nevertheless, it is difficult to imagine that the Indians had not experimented with polishing diamonds by the later medieval period, despite the inauspicious nature of the act. Pheru does make the strange remark that it was a fault to set a diamond upside down, with a small face at the top, a large one below. Could this be a reference to a simple table cut? European table-cut colored gems are sometimes seen set

upside down in later Mughal ornament, presumably because their bottom-heavy proportions would not permit them to be set the right way up in the characteristic Mughal *kundan* setting (Ogden 2013, 362–63). Victor Meen and Arlotte Tushingham, respectively gemologist and chief archaeologist at the Royal Ontario Museum, also noted many gems mounted upside down in the Iranian crown jewels (Meen and Tushingham 1968, 38). Sanskrit texts had repeatedly said that misshaped, broken, or poor-quality diamonds lacked beneficial qualities, an Indian prejudice noted by Islamic writers such as the medieval Persian scholar al-Birūnī, who said: “The people of India prefer the diamond that is unbroken and whole in shape with its sides sharp. They do not like diamonds with broken sides. In fact, they tend to regard this as an evil portent. Possibly this is so, because such a diamond has been overcome by something else” (Said 1989, 78). An early European recognition of this, by Garcia de Orta, 294 • Diamond Cutting in India was expressed in more colorful terms. He asserted Indians said that “as a virgin is more valuable than a woman who is not one, so the Naife [uncut] diamond is worth more than the cut one” (Markham 1913, 345).

European Cutting in India One of de Orta’s compatriots, and one of the first Europeans to sail to India, the Portuguese traveler and writer Duarte Barbosa, seems to have noted local diamond cutting. Barbosa traveled east in 1501, writing his account a dozen or so years later (Barbosa 1866, 1:221). He tells us that the diamonds from the “new mine” were “worked in the kingdom of Narsynga [Vijayanagar; that is, Hampi] itself.” In contrast, the old-mine diamonds, those to the north, were “not worked in India” (Barbosa 1866, 213). This suggests that diamond cutting was practiced at the southern group of diamond mines prior to the Portuguese opening up the direct sea trade. Possible corroboration for this is found in the account of the Russian Afanasy Nikitin, who visited India around 1470 and mentioned the diamond mines at Raichur—probably one and the same as Barbosa’s “Narsynga” mines (Major 1857, 21). Nikitin’s text, in Old Russian with borrowed Persian words, is problematic, but he referred to two different categories of diamond available there at significantly different prices. The text could be read to suggest a distinction between worked and unworked diamonds, but other interpretations are no doubt possible, including a distinction between diamonds suitable for ornamental use and those only useful for crushing and employing in lapidary work. Garcia de Orta observed that when diamonds were sold at the market in Hampi, “these diamonds of the old rock fetch a very high price, especially those they call Naifes, being those which nature has worked; while the Portuguese value those Diamond Cutting in India • 295 most which have been polished.” It is unclear whether he was noting a general Portuguese preference or implying that cut diamonds were also available at the market in Hampi (Markham 1913, 346).

Indian gold ornaments set with diamonds were being sent back to Portugal in the early 1500s, but there seems to be no description as to whether these were cut stones or not. An example is a gold belt studded with numerous colored gems and four diamonds that left India in 1513 en route to Manuel I of Portugal and had been sent by Governor Albuquerque (Crespo 2015, 22). A Portuguese manuscript in the Biblioteca Nacional de Portugal in Lisbon dating to around 1560–80, however, comments that diamonds cut in India fell short of European standards and were thus recut (Silva 1993, 22). This is perhaps the earliest of many European comments about the poor quality of Indian-cut diamonds. A note by Richard Hakluyt dated February 1600 gives prices to be paid for various products, primarily spices, in the East Indies. Included here are diamonds, rough, fully worked, and “chapas,” meaning plates, and thus cleavage fragments or thin, Indian-cut tables (Jones 1850, 159). Most of the European diamond cutters in India in the sixteenth century were probably Italians, but not all. Belgian professor John Everaert has pointed out that there were also

some Germans and Flemings (Everaert 2000, 92–93; Everaert 2004). Among the latter was the ill-fated Frans Coninck, a diamond cutter from Antwerp. Coninck had spent some time in London in his youth, then around 1580 went to live with his uncle in Venice before leaving for the Levant in 1581. He spent some time and much of his money in Aleppo, then traveled on to Goa, where, in 1588, he was murdered by his young adulterous wife and her lover (Burnell and Tiele 1885, 204–15). An engraving of this “horrific assassination” was included in a French edition of Jan Huygen van Linschoten’s *Itinerario* (Linschoten and Paludanus 1610, 216). European Cutters at the Mughal Court Mughal India has provided us with a remarkable early representation of a European diamond cutter. The so-called *Golšan Album* is an album of paintings and calligraphy formerly preserved in its entirety in the Golestān Palace Library in Tehran, but now with some pages dispersed in various collections. The calligraphy pages probably date mainly to the sixteenth century, but of relevance here are the margin paintings added to these in the early seventeenth. One of these pages of exquisite calligraphy had its margin embellished with figures painted at about the time of Jahangir’s accession, probably by the artist Nar Singh. These include two seated males, a partly draped angel in Renaissance European style, and three women; at top left is a beautifully rendered representation of a man in European dress standing at a diamond-cutting mill (figure 14.3). Many of the marginal paintings in the album appear to be based on European originals, but the very non-European way in which the perspective was handled here shows that the artist must have observed an actual mill of traditional European type (as in figure 6.8). We don’t know if this depiction was recognition of Jahangir’s existing interest in diamond cutting or an inspiration to him, but diamond cutters were soon evident in his court. William Hawkins went to India with the third East India Company voyage to negotiate trade with Jahangir. He recounts how in 1607, just two years after his accession, Jahangir summoned a diamond cutter to his court to cut a large diamond. The cutter “demanded a small fowle diamant to make powder, wherewith to cut the other diamant. They brought him a chest, as Diamond Cutting in India • 297

Figure 14.3. A diamond cutter from a border in the *Golšan Album*, ca. 1605. Credit: Freer Gallery of Art and Arthur M. Sackler Gallery, Smithsonian Institution, Washington, DC: Lent by the Art and History Trust; LTS1995.2.93a–b detail. 298 • Diamond Cutting in India he said, of three spannes long and a spanne and halfe broad, and a spanne and halfe deepe, full of diamants of all sizes and sorts; yet could he find never any one for his purpose, but one of five rotties, which was not very fowle neither” (Foster 1921b, 112). As an aside, we can note that Hawkins had been warmly welcomed by Jahangir, who, according to custom, wished to present him with a wife. To avoid this, without offending the emperor, Hawkins explained that as a Christian he could only marry a Christian woman. So, Jahangir produced a beautiful Armenian girl to whom Hawkins readily assented to be married. Hawkins died on the voyage back to Britain in 1613, and his body and Armenian widow were brought to his home in Ireland. She was “left alone among strangers in a strange land, but she had a very fine diamond worth £2,000 and some smaller ones worth £4,000, so that she had no difficulty in finding another English Husband.” She married Gabriel Towerson, who had sailed east in the same voyage as Hawkins in 1614, and they returned to Agra in 1617. She remained in Agra after Towerson went to the Moluccas when appointed chief East India Company factor there. He was killed in the massacre of the English by the Dutch at Amboyana in 1623 (Seth 1937, 99–100). It is unclear whether the cutter summoned to Jahangir’s court was one the emperor used regularly or was specially brought in for a one-off job. The cutter’s inability to find suitable poor-quality diamond in the emperor’s store of diamonds to crush to use as abrasive might point

to the latter. However, in 1618 some of the diamonds sent to Jahangir in Agra from the diamond mines at Kokhra were “given to the Government lapidaries to cut.” So by then at least Jahangir had his own diamond cutters. We can gain an idea of who they were from an account written by Edward Terry, chaplain to Sir Thomas Roe, who was in India in 1617–19. Terry, true to his Church of England disposition, reported that the Jesuits in the East Indies, despite their “boastings,” actually had had little success and adds that “the Jesuit congregations there, are very thin, consisting of some Italians, which the Mogul entertains, by great pay given them, to cut his diamonds and other rich stones” (Terry 1777, 427). Not all the cutters were Italians. Abraham, a Dutch diamond cutter in the service of Jahangir, went to Vijayapur in 1617 with the Mughal ambassador to buy diamonds (Kruijtzter 2009, 24). In 1647 Shah Jahan, Jahangir’s son, heard of a very fine diamond from a mine in the south and commanded that it be sent to him as part of the annual tribute (Aziz 1942, 180; Elliot 1875, 90). By the time the local ruler received this demand, his cutters had already started cutting the stone, so it was sent partly cut Diamond Cutting in India • 299 to Shah Jahan, who had his workmen complete it. The stone rough had weighed 180 ratis, about 160 carats, and after cutting “to disclose all its beauties, there remained a rare gem of 100 ratis weight, valued by the jewelers at one lac and 50,000 rupees.” The nationality of these cutters is unknown. Nor do we know the nationality of the cutters that Jean de Thévenot tells us the king of Golconda had working on “Stones of consequence” within his palace; lesser stones were worked within the fort, but not in the palace itself (Thévenot 1687, 99). The palace jewelers were entrusted with the fine stones with strict instructions to be discrete “least if Aurangzeb should come to know that his workmen are employed about Stones of great value, he might demand them of him” (Thévenot 1687, 99). When Shah Jahan received a particularly large diamond found at Kollur, the cutter of this was supposedly a Venetian. He is best known to us under the name Tavernier uses— Hortensi o Borgio—but Borges was his wife’s name, and it was Hortenzio Bronzoni of Venice that was buried in the Roman Catholic cemetery at Agra in August 1677 (Ball 1889, 1:31516; Blunt 1911, 42). The Italian Niccolao Manucci gives the diamond cutter’s name as Ortençio Bronzoni when he recounts the story of the large diamond (Irvine 1907, 1:237–38). It has been stated that this cemetery has graves of “Italians, employed as diamond cutters” (Anon 1853; Chunder 1869, 416). Terry had referred earlier to Italian Jesuit diamond cutters in Agra, but Bronzoni with a wife was clearly not a Jesuit.³ Cutters with the European Trading Companies The diamond cutters Tavernier noted at the Rammalakota mines may well have been Indian, but at least some European cutters in India found work with the English, Dutch, and other trading companies. In April 1623, the Dutch “had framed a mill in there 300 • Diamond Cutting in India house at Bander [Bandar, the port at Masulipatam]” to facilitate their diamond business. This is the earliest record I know of one of the European trading companies establishing cutting in India. A couple of weeks later the Dutch sent a diamond merchant and a “lappadariea” (cutter) to the new Golconda mine at Kollur (Foster 1908, 221, 229). Fifteen years later we hear how another Dutchman, Barent Pessaert, then president of the Danes at Machilipatnam, “hath of late made a journey to the dyamond mynes, where he hath bought a great quantity rough and procurd a man to cleanse them in this place” (Foster 1912, 65). “Cleanse” meant cut. The East India Company seemed less interested in establishing cutting in India. The Cholmley archive includes a letter written in December 1688 from John Cholmley to his brother Nathaniel in India that mentions the possibility of sending a diamond cutter to India (Cholmley 1664–93, fol. 0133- 4). This seems not to have been taken up, but in 1696 a syndicate of London jewelers, organized by Sir Francis Child, sent £2,500 in silver to India with a Dutch diamond cutter

called Abraham Pluymer in order to invest in diamonds, making a 130 percent profit on the diamonds they received (Samuel 1977, 52–53). In view of the importance of diamond cutting in later seventeenth- century London, it is surprising that there are few specific references to English diamond cutters in India until the later eighteenth century. One of the first mentions is found in a 1751 will for John Phillips, who was described as a diamond cutter and bound for Fort Saint David, near Cuddalore, by then the British headquarters in southern India (National Archives PROB 11/790/15). Tavernier also mentions another Dutchman in India, David Bazu, who cleaved a diamond of about 104 carats after the Banian merchants had turned it down (Ball 1889, 1:xlix, 2:99). He “risked much in cleaving this stone, and it was a great piece of good luck for him that it did not break into a hundred fragments. Still, for all that, it did not repay him; this makes it sufficiently plain that where the Banians refuse to bite there is nothing to be hoped for by the Franks [Europeans].” This Bazu, a rival to Tavernier, also sold important diamonds to Louis XIV, and landed Tavernier in trouble with the customs office in Ezurum in Armenia on his return from his sixth voyage east (Ogden 2017). The traditional method of cleaving a diamond was explained by Jean de Thévenot, a French traveler who visited Golconda in the 1660s: “When they [Indians] would cut a diamond to take out some grain of sand, or other imperfection they find in it they saw it a little in a place where it is to be cut, and then laying it upon a hole that is in the piece of wood; they put a little wedge of iron upon the place that is sawed, and striking it as gently as may be, it cuts the Diamond through” (Thévenot 1687, 99). The reference to “sawing” here is the small notch to facilitate the splitting. Indians were considered experts in the art of cleaving, and indeed Thévenot’s compatriot, the diamond merchant Tavernier, noted that those working at the diamond mines at Rammalakota were “much more accomplished” at cleaving than were the Europeans. Other Europeans reported much the same (Paulinus 1800, 392). There seems to be no clear evidence that Indians sawed diamonds; indeed, Thévenot seems to contrast the cleaving of diamonds, as just noted, with the way Indians sawed sapphires with a wire bow- saw in conjunction with emery powder in water (Thévenot 1687, 99).

Mughal Appreciation of European Cuts The Mughal emperors’ appreciation of cut diamonds continued through the seventeenth century, and they seem to have had a penchant for stones cut by Europeans. Bear in mind that in the early decades of the seventeenth century, the European rose cut 302 • Diamond Cutting in India was the most sophisticated cut; the brilliant would not be introduced until several decades later. The French textile trader George Roques tells us that after the Mughal emperor Aurangzeb, Shah Jahan’s son, conquered Golconda (in the late 1680s), he closed the diamond mines because, with his own and the looted stones, he had sufficient diamonds, but now wished to swap his rough diamonds for cut stones “since he only loved cut stones” (Voillot 1998, 106–7). In one case, he apparently swapped his rough diamonds with cut diamonds from two French traders even though his rough was worth the double of their stones. In 1698 John Fryer commented, “French and Dutch Jewelers coming over Land . . . made good Purchase by buying jewels here [India] and carrying them into Europe to be Cut and Set, and returning sell them here to the Ombrabs [court grandees], among them Monsieur Tavernier and now Monsieur Rezin and Monsieur Jardin” (Fryer 1698, 88–89). This is reminiscent of the early sixteenth- century Jawāhir- Nāma, which stated a rough diamond might be bought in India at four florins per carat, but that “When it falls into the hands of the European cutter and he carves it, and it is afterwards brought back to Hind [India], it is possible that it will be bought at 15 florins a carat.” However, it is unclear why the Mughals wanted European- cut stones some two centuries after diamond cutting had been established in India and almost a century after

Jahangir had his own court diamond cutters. The Shortcomings of Indian Cutting Edward Terry, in India in 1617–19, praised Indian craftsmanship and noted how “curious [skillful] they are in cutting all manner of stones, diamonds as well as others” (Terry 1777, 127–28). This is one of the few positive notes among the many derogatory comments made by Europeans about the quality of diamond cutting in India.

• 303 of diamond cutting in India. An early negative comment was by the French traveler Pierre- Olivier Malherbe (1569–1611), who visited diamond mines in India at the beginning of the seventeenth century and observed that Indians were not good at cutting the stones (Kundra 2014, 20). When Tavernier described the “numerous diamond cutters” at the diamond mines at around 1640, he noted, “The Indians are unable to give the stones such a lively polish as we give them in Europe” (Ball 1889, 2:43). The reason was that “their wheels do not run so smoothly as ours. For, being made of steel, in order to grind it on the emery . . . it has to be taken off the tree [i.e., its axis] and cannot be replaced so as to run as evenly as it should do. If they possessed the iron wheel like ours, for which not emery but the file is required, it is not necessary to remove it from the tree in order to file it, and they could give the stones a better polish than they do.” John Fryer, surgeon to the East India Company, also refers to the use of steel diamond- cutting wheels in Surat half a century later: “They cut Diamonds with a Mill turned by Man, the String reaching, in manner of our cutlers wheels, to lesser that are in a flat Press, where under Steel- wheels the Diamonds are fastened and with its own Bort are worn into what Cut the Artist pleases” (Fryer 1698, 113). The references to steel wheels rather than iron ones mirror the descriptions of sixteenth-century Europe in diamond cutting by Biringuccio and Cellini, among others. The implication is that the cutters in seventeenth-century India were still using a form of equipment, perhaps characteristically of Italian type, that had been superseded in Europe. Cellini also noted that if you “bear a sufficiently heavy weight you can increase the pressure of the diamonds upon the wheel.” Tavernier a century later said that this was no longer European practice, stating, “The Indians do not agree with us in believing that weighting them causes flaws in the stone” (Ball 1889, 2:45). He mentions a case where a diamond was weighted with 150 pounds of lead. Even as late as the mid-eighteenth century, David Jeffries also noted that although most of the diamonds imported from India were not well cut, “there come now and then stones tolerably well wrought and polished; but these have been supposed to have been done by Europeans, and upon their mills, and skeves [scaifes], and to have been the property of such [i.e., Europeans]” (Jeffries 1751, 121). In 1790 in Calcutta an Englishman, Richard Brittridge, announced that “having procured the necessary implements for Cutting and Polishing Diamonds; and having in employ European workmen, of the first Abilities in that line, will engage to cut and polish Diamonds, equal to those manufactured in Europe, and on reasonable Terms” (Calcutta Chronicle, 2 November 1790). Despite his criticism about steel wheels and overweighting, Tavernier tells us that the typical mill at Rammalakota was “like ours” with a large wheel turned by four men (Ball 1889, 2:45). Two hundred years later, Thomas Newbold, an army officer with the East India Company, mentioned diamond cutting in the same area and noted that the cutters “have long been famous for their skill as lapidaries” (Newbold 1843, 231). He illustrates the component parts of “the apparatus which has been used, time out of mind, by the diamond polishers of Munimudgoo, a place where most of the diamonds found in the Pennar district were polished, and sent to Golconda for sale” (Newbold 1843, 236–37). The mechanism he describes is essentially the same as the European mill, but it has a simpler crank, and the legs were sunk in the earth rather than being rigidly set on a sturdy London or Antwerp timber floor. From Newbold’s drawings (figure 14.4) and descriptions (the

two don't always equate) and a reconstruction (figure 14.5), it is hardly surprising Diamond Cutting in India • 305 that this style of Indian mill was less able to deliver minuscule perfection. Incidentally, Newbold does describe the nine- inch- diameter scaife as being of iron. Cutting Styles in India The drawings of the diamonds that Jean- Baptiste Tavernier sold to King Louis XIV of France provide a good introduction to the type of cutting being carried out in India in the seventeenth century. All were, he says, cut in India (other than the few rough diamonds). There are four main classes: • Thin rectangular or polygonal “lasques” • Table cuts • Multifaceted “Mughal cuts” • Irregular forms The thin lasques are ubiquitous in Mughal ornament. These are thin cleavage slices, the top and bottom faces of which have been polished, as have the beveled edges. This shape is seen in Tavernier's drawing (figure 14.6). The diamond of this type in figure 14.7 has beveled edges, which retain much of the original crystal surface. The large quantity of such stones that have survived in Mughal jewelry, Indians' known prowess with cleaving, and the poor regard for such cut stones in Europe suggest that this form was largely cut by Indian cutters. The simple table cuts sold by Tavernier could have been cut by Indians or Europeans. One he described weighed just over sixty- three carats and was “bought in the year 1653 at the Kollur mine. It is beautiful, pure, cut at the mine” (Ball 1889, 2:99). 306 • Diamond Cutting in India Figure 14.4. (left) A nineteenth- century Indian diamond- cutting mill as drawn by Captain Newbold. After Newbold (1843). Figure 14.5. (above) Reconstruction of Newbold's mill from figure 14.4. 3D image: Jack Ogden. Figure 14.6. (bottom left) Thin diamond “lasques” as drawn by Tavernier with their modern three- dimensional renderings. Photo: Jack Ogden. Figure 14.7. (bottom right) A diamond lasque. Credit: Courtesy of Benjamin Zucker. Photo: Jack Ogden. The So- Called Mughal Cut Figure 14.8. The diamond later known as the Orlov, by Frans de Bakker, Amsterdam, 1767. Credit: Rijksmuseum, Amsterdam, RP- RP- P- 1911- 2912. Gift of M. Onnes van Nijenrod. 308 • Diamond Cutting in India The multifaceted type of cut, what Herbert Tillander described as the “Mughal cut,” may well have generally been cut by Europeans. These cuts are essentially European rose cuts as applied to larger diamonds of varied shapes. Europeans usually referred to them as roses. Tavernier had the 157- carat diamond he bought in Ahmedabad cut into a pear- shaped “rose” of 94 1/4 carats (see figure 13.3) (Ball 1889, 2:98–99). A similarly shaped diamond of thirty- two carats was described by him as a large diamond carré of almond shape (Ball 1889, 2: facing 100 top right; Bapste 1889, 403). Here he used the term carré to mean “faceted” in a general sense. The domed form of this gem, with its flattish underside and myriad triangular facets, is close to that of the “Great Mogul's diamond,” originally from the Kollur mine, that Tavernier says he was shown by the Mughal emperor Aurangzeb— the diamond supposedly cut by the Venetian Hortensio Borgio. Tavernier reports that it weighed about 280 carats when he saw it, but it had weighed nearly three times that when rough (Ball 1889, 1:315–16, 2:97). It was, he says, the largest diamond he had seen in India, a round rose the shape of half an egg. Valentine Ball has argued that this huge stone was later damaged or deliberately reduced in weight and became what we know as the Koh- i- Nur (Ball 1889, 2:331–46). Several writers have suggested it might rather be the Orlov Diamond, one of the few multifaceted “Mughal” gems to survive (figure 14.8). Although the Orlov has a similar shape to Tavernier's sketch of the Great Mughal's diamond, accepting them as one and the same would mean that Tavernier overestimated the weight of the Great Mughal's diamond by some 50 percent. A recent proponent of this theory, Anna Malecka, argues that Tavernier had never actually seen the Mughal's diamond (Malecka 2016). Tavernier also referred to seeing “little Drawers full of . . . great Roses of Figure 14.9. Multifaceted diamond illustrated by Tavernier and sold by him to Louis XIV. Described by him

as cut in little facets in India, with computer-generated three-dimensional reconstruction. 3D image: Jack Ogden. 310 • Diamond Cutting in India

Diamonds” in the royal treasury in Constantinople, presumably also so-called Mughal cuts (Tavernier 1677, 48). The top of the Orlov has a similar facet pattern (although less attenuated) to the lower half of a remarkable diamond illustrated by Tavernier (figure 14.9). This diamond is essentially oval with a flat upper table surrounded by facets, tapering down to its pointed base—essentially a multifaceted version of a brilliant cut. Is it perhaps not completely impossible that this stone’s arrival at the French court prompted the development of the European brilliant? It was certainly cut in India before, or not long after, the brilliant cut first appears in Europe. This stone, and the Orlov, exhibit a combination of triangular, square, and attenuated facets remarkably similar to the Koh-i-Nur prior to its recutting in the mid-nineteenth century and the Nassuck Diamond prior to its recutting a generation earlier (Balfour 2009, 202–203). A very similar style of cutting is also seen with the Great Mughal’s “topaz” illustrated and described by Tavernier, almost certainly a yellow sapphire from Sri Lanka that Tavernier says was bought at Goa (Ball 1889, 1:318–19, 2:102). Aurangzeb was annoyed that Borgio had reduced the weight of his great diamond by such a huge amount, a criticism shared by Tavernier, who added “he was not a very accomplished cutter” (Ball 1889, 1:216). However, Borgio’s cutting of this stone, if he did indeed cut it, reinforces the view that the so-called Mughal cut was actually a European cut. If a European-trained cutter in India was exposed to a diamond far larger than those he generally encountered in Europe, covering the surface with myriad small facets, as in a rose cut, would be a likely choice, and of course would retain the most weight. The large irregular blue diamond illustrated by Tavernier and sold by him to Louis XIV of France (figure 14.10), the stone that eventually became the Hope Diamond, has an irregular shape and lack of small facets that might be taken to separate it from the multifaceted Mughal cut. A somewhat similar form is seen with the fancy light, orange-pink diamond of just under twenty-five carats in figure 14.11 that was sold at auction by Christie’s of London in 1999 and is now in the al-Sabah collection in Kuwait (Haidar and Sardar 2015, 244). This is also probably of seventeenth-century date. It is hard to imagine that the blocky form of Tavernier’s blue, and perhaps that of the orange-pink stone, was intended to be worn like that, and they may have been “pre-forms” to best reveal their quality and their potential for further cutting. It is perhaps not coincidental that both these stones are colored—a property that might not have been so obvious in their original as-mined form.

Other Indian Cuts A few years after Tavernier, in 1698, John Fryer listed and drew the forms of diamonds that could be bought in India by Europeans (figure 14.10). (top) Tavernier’s drawing of the large blue diamond (color added) sold by him to Louis XIV. Described by him as cut in the Indian fashion. After Tavernier. Figure 14.11. (bottom) Large orange-pink diamond of 24.775 carats. Credit: Copyright Christie’s Images Limited 1999. Diamond Cutting in India • 311

European or other traders (figure 14.12; Fryer 1698, 213). He noted Figure 14.12. John Fryer’s 1698 drawing of the forms of diamonds purchased by Europeans in India and generally recut. 312 • Diamond Cutting in India

that most diamonds cut in India were sold there, since they were “coming short of the Fringes [Europeans] in Fancy”; so mainly rough was exported to Europe, “where they are both set and cut to more advantage” (Fryer 1698, 113). His list is headed “The Names of Rough stones.” In addition to a standard octahedron labeled “A point,” he shows various locally cut flat stones, the little flat lasques described above. He shows a side view of a domed shape with little triangular facets that he calls “a Rose stone if round” but “if long a Fossil.” Fossil is not a term encountered in this context elsewhere and is presumably a misprint for fosset, a spelling of facet we find, for example,

in some older English editions of Tavernier. He also depicts what appears to be a pear-shaped rose, labeled “A Naife.” The Indian-cut diamonds viewed by Europeans as being poorly cut were the diamonds from India without “order or grace” as described by Robert de Berquen (Berquen 1669). These were the “lasks” or “lasques,” the rather irregular and often thin table forms purchased by European traders as raw material for recutting. A note by Richard Hakluyt written about 1600 deals with the spices and gems traders should seek to buy in India. He refers to “Diamantes chapas which are to be bought, and gaine made in working them” (Jones 1850, 158–59). Diamantes chapas was the Portuguese term for lasques. Surviving Old Indian Cuts Some older Indian-cut diamonds are, luckily, preserved, despite not appealing to European taste in the past. These don’t include the historic Koh-i-Nur, unfortunately, recut as a very disappointing, shallow brilliant cut in 1852. But we do have the magnificent fancy light-pink Ta viz pendant in figure 14.13, the Shah Jahah diamond, which was almost certainly cut by Indian cutters (Keene and Kaokji 2001, 129). There is also the extraordinary Shah Diamond, now in the Kremlin in Moscow (Balfour 2009, 251–53). This elongated diamond has a groove cut around one end so it can be affixed to a cord and the other end engraved with the names and dates of its royal owners, Nizām Shāh, Shah Jahan, and Fath ‘Alī Shāh, spanning the late sixteenth to early nineteenth centuries. This engraving must surely have been carried out by a series of consummate Mughal craftsman. David Jeffries in the mid-eighteenth century reflects the feelings—and taste—of the time: “The manufacture of them they [Indians] seem to know very little of, as appears by the wrought Stones that come from thence [India], none of them being fit for use, and therefore are always new wrought when brought to Europe; which I shall describe as follows: They are called Lasks; they are in general ill shapes, or irregular in their form at the girdle; their substance, or depth, is ill proportioned; some have

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Figure 14.13. Fancy light-pink diamond Ta viz pendant of 56.7 carats. Credit: The al-Sabah Collection, LNS 2156 J. Copyright © The al-Sabah Collection, Dar al-Athar al-Islamiyyah, Kuwait. 314 • Diamond Cutting in India

more of the Stone’s substance at top than at the bottom; their tables are seldom in the middle, or center, of the Stone, and the collets the same; and sometimes the tables are of an extravagant breadth, and sometimes too small” (Jeffries 1751, 115–16). As late as the 1860s, the *London Review* commented, “The facettes on Indian stones [diamonds] are rarely ground quite to a plane surface; they are almost invariably rounded by the imperfect method of polishing employed” (18 October 1862, 338). Five years later, diamond expert Harry Emanuel said, “In India, where numbers of diamonds are still cut, the work is rough and defective—they go for weight not beauty” (Emanuel 1867, 666). What goes around comes around. Today, the majority of the diamonds sold worldwide are cut in India. It is hard to imagine that Indians had not attempted to “improve” the surface of some less-than-perfect diamond crystals, but more sophisticated cutting and polishing of diamonds may have been introduced into India from further west, probably by the early 1500s. European cutters worked in India and may have been responsible for the so-called Mughal cuts. Traders, such as Chalmley and Tavernier, also provide ample evidence for Indian diamond cutting, and these stones are found in profusion in Mughal jewelry. Their typically flat, irregular form, however, was largely scorned by the Europeans and served as raw material to export for recutting. Diamond Cutting in India • 315

India had been the world’s primary source of diamonds since antiquity and probably Europe’s only source until the seventeenth century. This changed in the eighteenth century when diamonds were discovered in Brazil. This so astonished some that they refused to believe it, considering it subterfuge by the Portuguese merchants. But the accounts were true, and for just over a century, Brazil took the crown

n as the world's major supplier of diamonds, until that honor passed to South Africa.¹ The discovery of Brazilian diamonds had come at the right time. In 1813 the British mineralogist John Mawe wrote: "The diamond mines of India have long been declining; several of 15 The Eclipse of Indian Diamonds them are now abandoned and scarcely any of the rest contribute at present to the supply of the European market" (Mawe 1813, 39). The impact the Brazilian diamonds had on diamond availability and use in Europe is brought into focus when it is noted that the output of Indian diamonds in the century or so prior to the discovery of the diamonds in Brazil has been estimated at anything between about 5,000 and 50,000 carats a year. The 1731 fleet from Brazil to Portugal is supposed to have carried no less than 100,000 carats; two years later it was 300,000. And annual Indian diamond exports do not necessarily reflect annual mine output. George Watt, a botanist and author of the ten-volume *Dictionary of the Commercial Products of India*, astutely remarked that "the diamonds which found their way all over the civilized world from the Indian mines . . . may have largely represented the surplus accumulation of gems collected during many previous centuries" (Watt 1889–93, 3:93). Despite the rise of Brazil and later Africa, diamonds continued to be found in India, and Valentine Ball (1881a, 1881b) discussed many working mines, and discoveries in them, during the nineteenth century. A large stone was found in "Hyderabad" in 1830. A piece was broken off it and sold, and the remaining part still weighed 305 carats. A glass cast was made of it, now in the Royal Collection (figure 15.1), and the original was cut and owned by the Nizam of Hyderabad. Recent studies have shown that India still probably has significant reserves of diamonds, some more than a kilometer down in the earth, but as far as historical exploitation goes, the early eighteenth century marks the change in focus from India to Brazil (Subhash Babu et al. 2015). Brazil

There are several versions of the history of the original discovery of diamonds in Brazil. The most prevalent story is that pebbles found in the river at Ouro Preto in Minas Gerais were being used as gaming pieces or children's playthings until they were spotted by D. Lourenço de Almeida, who was the provincial governor there from 1720 to 1732. De Almeida had previously been in Goa in India, so he recognized these pebbles as rough diamonds and began to secretly collect them. Somehow the news got out, and he had to announce his discovery to the Portuguese crown in what the historian Charles Boxer described as an "ingeniously worded dispatch" written in July 1729 (Boxer 1962, 206; Adams 1795, 134–35). The crown was not taken in by de Almeida's protestations that he had not recognized the little pebbles for what they were sooner and ordered him to impose taxation and limitations to working. De Almeida appears to have partly complied until 1732, when he lost his position there (Boxer 1962, 205–8). A report that reached London in the summer of 1730 and was quoted in the *Ipswich Journal* may have exaggerated de Almeida's fate when it said that "his Portuguese Majesty had sent a Man of War with some Officers on Board to Brazil, with order to arrest the Governor General, who having discovered a rich mine of Diamonds, has taken out of the same to the Value of immense Sums, without giving the least Notice thereof to the King" (*Ipswich Journal*, 27 June–4 July 1730). The explorer Sir Richard Burton, best known for his Arabian adventures, visited some of the diamond mines in Brazil in the 1860s. He refers to the discovery by de Almeida as the "official" account, but notes other traditions (Burton 1869, 106). One was that the first man to send diamonds back to Portugal was the pioneer Sebastiao Leme do Prado, who in 1725 had found diamonds in the Rio Manso in Minas Gerais, but was unable to sell them locally. Burton says the same happened to a friar Bernardino da Fonseca Lobo, who supposedly found a large diamond in the Serro do Frio in Brazil. A local tradition was that the friar had also been in India and when, around 1727, he saw gold miners using shiny

little stones as counters in backgammon, he recognized what they were, collected them, and headed back to Portugal. Half a century before Burton, the English poet and *Eclipse of Indian Diamonds* • 319 specialist in Spanish and Portuguese history Robert Southey also mentioned Bernardino da Fonseca Lobo, but says he was rewarded by being made public notary in 1734 (Southey 1819, 274–75). Southey also says: “A rumor that such precious stones existed in that part of the country had long- been curr ent.” Charles Boxer has given a detailed account of the early mining in Brazil, and details of the conditions, security, and inevitable smuggling subterfuges (Boxer 1962, 204–25). T he Arrival of Brazilian Diamonds T he first indication of British awareness of diamonds in Brazil seems to be a news report in October 1725 that referred to the return earlier that month of the Brazil fleet to Lisbon, “onboard of which was 22,000 Casks of Sugar, and a considerable Quantity of Gold, Silver and Diamonds.” A report in April 1729 says that a very rich Portuguese ship coming from Brazil had been attacked and sunk by Algerian pirates who, before the ship went down, managed to take “a Box of Diamonds.” However, the presence of diamonds in Brazil cannot have been widely known because when the Brazil fleet returned to Lisbon in late 1729, it brought a large amount of diamonds, which was considered “extraordinary, it having never been known that Diamonds were found there before.” The mine itself was reported to be “not far from Rio de Janeiro, a Mine that abounds with Diamonds” (see also Sarmento 1731–32). One diamond supposedly weighed “rough as it is, double the weight of the biggest Diamond yet known in Europe, and is sent to the Lathe to be try’d.” The British press reports mirror Portuguese records that show that in the closing years of the 1720s, diamonds had been reaching Lisbon with passengers arriving from Brazil (Boxer 1962, 206).² In about 1730 a prospectus for the establishment of a min³²⁰ • *Eclipse of Indian Diamonds* sing and trading company for the diamonds of Serro do Frio in Minas Gerais, Brazil, was submitted to King João V of Portugal (1689–1750). A João Mendes de Almeida argued successfully against this on the basis that profits would be diverted from Portugal to foreigners, including “Jews from the north” (de Almeida ca. 1776). To start with, the quantity of diamonds brought to Portugal from Brazil increased yearly. In the spring of 1732, the king of Portugal declared that all future imports of diamonds from Brazil would have to be registered and duty paid. That a significant part of the trade was then in private hands is shown by the case of a ship arriving in Lisbon from Brazil in 1731. The captain and a passenger, owners of “a large Quantity of Diamonds on board,” were subjected to the Inquisition “on pretence of their not being Christians; but probably with a View to fleece them of their Riches.” Export from Lisbon to the rest of Europe seems to have been common. Some were sent to Holland and others to England. Indeed, in the summer of 1732 there was the suggestion that the duty on diamonds imported into London from Lisbon would be raised because such import was at the expense of gold imports and “prejudicial to the Nation.” There was a huge clandestine trade as well, of course, and in 1733 some diamond merchants arriving in Lisbon were seized to help ascertain the extent of the problem. As early as January 1730 the *London Evening Post* reported that “a great Quantity of those new Diamonds have been lately imported from Lisbon, and it is thought it will lower the Price of the Oriental Diamonds very much.” The quantities were indeed prodigious. One London newspaper said that not less than 100,000 carats of diamonds were carried from Brazil to Portugal in 1731. By 1732 diamond prices had fallen considerably, and so in 1734 the king of Portugal ordered closure of the Brazilian diamond mines “in order to raise the Price,” and by *Eclipse of Indian Diamonds* • 321

Figure 15.2. Washing for diamonds in Curralhino, Minas Gerais, Brazil, from Johann Baptist von Spix and Karl Friedrich Philipp von Martius’s 1824 *Travels in Brazil*, in the years 1817–20. Credit:

Private Collection/Bridgeman Images. 322 • Eclipse of Indian Diamonds January 1735 diamond prices in Europe had risen “to near 20s. a carat and [were] daily increasing.” Fewer diamonds were then available, and London diamond dealers “sent Commissions to their agents at Paris, Lisbon and Vienna, to purchase all the Diamonds they can at any price.” In mid- 1735 there seems to have been a change of heart. The Newcastle Courant for 28 June 1735 noted: “The Court of Portugal has offered to permit one or two Annual British Ships to sail for Brazil, and import the Merchandize [gold and diamonds], which in Consequence will be far more advantageous to this Nation than the Assiento [slave] Trade, which seems to be in a very dwindling Condition.” Nevertheless, African and other slaves continued to be a significant part of diamond and gold mining in Brazil, and Britain was keen to benefit from this trade too. A 1739 petition from the Royal African Company to King George II requested the support of the British envoy at Lisbon in their negotiations to supply West African slaves to work in the gold and diamond mines in Brazil.³ Numerous depictions exist of diamond mining in Brazil, particularly from the nineteenth century, many showing the use, and misuse, of African slaves. One such is figure 15.2, a depiction of washing for diamonds in Currathino, Minas Gerais, Brazil. We see slaves sitting on a bench in a shallow pond. They wash the gravel carried from the river in wooden bowls by the two figures at upper left. The seated figure on the right on the bench holds up his hands to show he has found nothing, while his colleague, standing in the center, is showing the diamond he has just retrieved, prior to putting it into the bowl on the pedestal in front of him. The standing figure in European dress, who has arrived on the horse, will put the found diamonds into the small bag he is holding. On the far left, largely out of view in this detail, is the overseer who keeps an eye on the washing. ⁴ Not surprisingly, the Portuguese did try to play down their new discoveries in Brazil to prevent a price drop, and it was reported that “’Tis even pretended, upon the report made by several Persons of the Place where these Diamonds were found, that we shall hardly have any more from thence, because they were not taken out of a Mine, but fished up from the Bottom of some small Rivers, where they can find no more, except one, in which there are some left” (Daily Courant, 20 March 1732). People were not fooled, and in that same year Sir James Tobin, a commissioner in London, wrote to Major John Roach with the East India Company in Madras, “The diamond mine discovered Eclipse of Indian Diamonds • 323in Brasille has caused an entire stagnation in the commodity” (Yogev 1978, 111). Britain was keen to benefit from the Brazil diamond trade, and the British consul in Lisbon, Charles Compton, wrote to the Duke of Newcastle, then the secretary of state for the Southern Department (responsibilities included the American colonies and the Roman Catholic states of Europe), in January 1732 advocating the removal of the duty on uncut diamonds in Britain to encourage the greater import of diamonds from Brazil.⁵ This was pursued and, as noted above, in March 1733 a bill was passed “for the free Importation and Exportation of Diamonds, Pearls, Rubies, Emeralds, and all other Jewels and precious stones.”

Brazilian Diamonds Prior to the 1720s Although most of the evidence points to the late 1720s as the beginning of Brazilian diamond exports to Europe, an earlier date is not impossible. Many sources, particularly on the Internet, now give the date of discovery as 1714, but I cannot locate the original documentation for this. An 1825 report said that the mines were first discovered in 1681, but this is perhaps unlikely since gold was first discovered in the Minas Gerais region in 1693 and the area was only settled to a significant extent after about 1720. ⁶ However, we find diamonds imported from America listed in 1694 London customs records, just a year after the discovery of gold in Minas Gerais (Houghton 1727, 70). Going back even further, we have *The Admirable Adventures and Strange Fortune of Master Antonie Knivet*, a detailed account by an Englishman who sailed from

Plymouth in 1591, but was captured by the Portuguese and spent some time in Brazil (Purchas 1625, 4:1230). The remarkable story includes the statement: “In this town [which he calls “Menuare” on the river “Jawarie,” presumably modern Javari] . . . were found great store of gold in peeces, and also Stones of Cristall, and many other good stones; some found diamonds, and a kind of blue stones that the Portugals did esteeme of very much.” We can also note that Garcia de Orta in the sixteenth century mentions that both the sixteenth-century Spanish historian Francisco de Tamara and a “Dominican friar named Domingo de Baltonas”—presumably Domingo de Baltanás y Mejía (1488–ca. 1560)—had said that diamonds had been found in Peru, although de Orta seems skeptical (Markham 1913, 348). In de Orta’s day, the Spanish viceroyalty of Peru included quite a lot of what is now Brazil. That the early history of diamonds from Brazil is clouded is not surprising. If some diamonds had been found in Brazil in the seventeenth century, we would certainly expect this to have been kept as quiet as possible. Portugal would know only too well that any public acknowledgment of diamonds in Brazil would almost certainly have led to a price drop and also have exacerbated piracy. Even the English jeweler David Jeffries, writing in the mid-eighteenth century, doubted that diamonds were coming from Brazil. He suspected that the “Brazilian” diamonds reaching the European market were Indian stones purchased with Brazilian gold. In support of this view, he tells us that in 1734 a former governor of Fort St. George (Madras) told him that while stationed there, “he was informed that the Brazil people had long carried on a secret trade with the Indian people at Goa, for Diamonds” (Jeffries 1751, 70). Harry Emanuel, perhaps drawing on Jeffries, also noted that disbelief followed the reported discovery of diamonds in Brazil and that some stones were shipped to Goa and thence entered the trade as Indian diamond (Emanuel 1867, 57). The Reverend John Adams said that the Brazilian stones were “bought up in the rough state by the English and Dutch, who cut them, and then dispose of them all over Europe. They are neither so hard nor so clear as those of the East-Indies, nor do they sparkle so much, but they are whiter. They are sold ten per cent, cheaper, supposing the weight to be equal” (Adams 1795, 134–35). This contradicts another account that says that the diamonds of Brazil were “generally cleaner than those of the East.”⁷ Diamonds from Elsewhere in the Americas Diamonds from other areas of the Americas probably played little if any part during our period, but a few possibilities are worth noting. Among the Cecil Papers at Hatfield House is a letter from Sir Walter Raleigh to Sir Robert Cecil written in November 1595, soon after Raleigh returned from his first voyage searching for the fabled city of gold, El Dorado (Salisbury 1894, 457). While describing Guiana, now the Venezuelan region of Guayana, he enthused about the diamonds to be found there: “I assure myself that there are not more diamonds in the East Indies than are to be found in Guiana.” His exaggerations and lies about the riches of Guiana contributed to his later disgrace and execution. But was there a kernel of truth in Raleigh’s report? Some three and a half centuries after Raleigh’s death, significant alluvial diamond deposits were discovered in Venezuela, and total yield since then, official and unofficial, probably totals close to all the diamonds mined in India since antiquity. There is also the report of the voyage of the French explorer Samuel Champlain in Canada in 1603, which found in Quebec “Diamants in the Rockes of slate, which are better than those of Alonson” (Purchas 1625, 4:1611). This might well hearken back to the earlier French explorer Jacques Cartier’s discovery of “diamonds” in Quebec in 1541—they turned out to be rock crystal (Cook 1993). However, diamonds are indeed found in Canada and in the Quebec region. In 1577 the English privateer Martin Frobisher returned from his second voyage even farther north in the

Americas, seeking a northwest passage. It was reported that the many diamonds, rubies, sapphires, and other jewels found in this voyage were sold privately (Sainsbury 1864, 55–60). Borneo Turning to the east, there was a small but not insignificant import of diamonds from Borneo into Europe, particularly around 1610–20 (Ogden 2005). Some knowledge of Borneo in the West can probably be dated back to the geographer Ptolemy around AD 150, and in medieval times European travelers, such as Marco Polo in the late thirteenth century and Friar Odoric of Pordenone a generation later, mentioned Borneo, but make no mention of diamonds. The first unambiguous European mention of Borneo diamonds comes from the Portuguese traveler and writer Fernão Lopes de Castanheda (1500–1559), who describes diamonds from Tania Pura, the old capital of Borneo. Then Caesar Fredericke, a merchant from Venice who traveled to the East Indies and beyond in the second half of the sixteenth century, noted that naturally pointed diamonds came from “Java” and were weightier than the Indian stones (Hakluyt 1599, 372). One of the first actions of the East India Company after its foundation in 1600 was to translate into English a report written by the Dutch merchant Jan Huyghen van Linschoten, who had traveled to the East Indies in the 1580s, that described the diamonds to be obtained in the region (Burnell and Tiele 1885, 1:112). By Borneo, Linschoten tells us, was “the straight called Tania Pura . . . where many diamonds are found, that are excellent, they are small, but very good, and heavier, which is good for the seller, but not for the buyer” (Burnell and Tiele 1885, *Eclipse of Indian Diamonds* • 3272:137–38). He added, “Sometimes they find Diamonds of one hundred and two hundred Mangelyns [the Mangelin weight varied depending on time and place from around a carat to almost two carats] and more, but very few.” Another document survives, seemingly translated from a Dutch letter, that says: “From Sukadana [in Borneo] is to be procured the best diamonds in the world” (Danvers 1896, 79). The East India Company moved quickly and in their first voyage established a trading factory at Bantam on the island of Java in 1602. On 4 December 1608, John Saris, chief factor there, wrote to the East India Company in London: “I have many times certified your worships of the trade the Flemings follow to Sukadana which place yieldeth great store of diamonds, and of their manner of dealing with them” (Danvers 1896, 22; see also Sainsbury 1862, 178). The Dutch, he explained, bartered the diamonds at Sukadana with gold from Banjarmasin (also in Borneo) or “the blue glass beads which the Chinese make.” Saris proposed that similar blue beads could be made cheaply in England, but in any case, the company should enter the diamond trade and would surely make its profits when the diamonds were finally sold in Europe. The English sent a jeweler to Borneo, Hugh Greet, who, as noted in the East India Company records, “went out a very poor man, much indebted, carried himself very mutinously, debauchedly and unfaithfully gave away 1000 riyals belonging to the company, employed the company’s moneys to his own use, when he bought diamonds for the Company, reserved the choicest for himself” (Sainsbury 1884, 387). Nevertheless, despite the many and thoroughly documented shortcomings of Greet and his successors, diamonds from Borneo began to be dispatched to London from 1614 (Ogden 2005). The problems encompassed the incompetence of the English agents, lack of capital, competition, climate, and even headhunters, and by the early 1620s the flow of 328 • *Eclipse of Indian Diamonds* diamonds from Borneo to England had almost ceased. English eyes were now on Indian diamonds. The Dutch continued in the trade, and indeed, while in India, Jean- Baptiste Tavernier was sent six diamonds of three or four carats each from Borneo by the Dutch General Vandime (Ball 1889, 2:67–68). These were sent to Tavernier to see if he could test the general’s belief that the Borneo diamonds were softer than the Indian. As Tavernier noted, the belief was unfounded. There seems no evidence that

diamonds were being cut in Borneo or elsewhere in southeast Asia in the seventeenth century. Tavernier recounts how he was shown a dagger by the king of Bantam in Java, the top of the hilt of which was set with large faceted diamonds that had been cut in Goa (Ball 1889, 2:276–79). The rest of the hilt and the sheath were covered in empty settings. The king asked Tavernier to find diamonds to fit it. Tavernier explained that it was normal to make the setting to fit existing diamonds and that the only option was to find diamonds at Goa, Golconda, or the Indian diamond mines that could possibly be cut to fit. Hubert Bari has suggested that the abundant rose-cut diamonds set in the “Lombok Treasure” from Indonesia were diamonds brought there by the Dutch, cut in Antwerp (Bari and Sautter 2001, 96–101). Certainly the diamonds in this treasure look more European-cut than Indian-cut, but the extent of the Europe–southeast Asia trade in rose diamonds in the seventeenth century is unclear. The majority of the diamond-set objects in the “Lombok Treasure” would seem to be later than the seventeenth century. The East India Company’s involvement in the Borneo diamond trade at the beginning of the seventeenth century had lasted barely ten years, but it could be argued that it provided the company with the experience it needed to become a lead player in the exploitation of the diamonds from India and helped to establish London as the world center for the diamond trade.

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Africa From the mid-nineteenth century, Africa has been a major source of diamonds. Initially there were discoveries in South Africa, but over succeeding decades, diamonds were found also in what are now Namibia, Botswana, Zimbabwe, the Congo, Angola, Sierra Leone, and elsewhere. Earlier knowledge of diamonds in Africa is not impossible. The Portuguese were active in Angola as early as the fifteenth century, and from 1749 we have the comment that “the discoveries made by the Portuguese in this century, in the Brazils and the Kingdom of Angola, prove that other countries are enriched with that valuable treasure [diamonds] in the bowels of the earth. Though it is commonly allowed, that these later works do not produce such good stones as those which are found in the East India” (Anon 1749). Perhaps more information about early awareness of Angolan diamonds can be found in Portuguese archives.

Central Asia In 1734 it was reported that diamonds and gold had been discovered “in the Southern Parts of Russia, towards Persia and the Mogul’s Country.”⁸ Whether this was accurate or optimistic is uncertain, but we can note that both diamonds and gold are now known from Kazakhstan. There are persistent rumors of small, bright diamonds being found in parts of what is now Pakistan. Some confusion with the bright rock crystal from Balochistan, sometimes sold as “diamond quartz,” “Pakimer diamonds,” or “Bolochistan diamonds,” is likely, but some still insist that the occasional true diamond is found.

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Indian Diamonds After 1730 Despite the rise of Brazil, some diamonds continued to reach Europe from India through the rest of the eighteenth century and into the nineteenth. The British East India Company lost its monopoly in 1694 but merged with the competing “English Company Trading to the East Indies” in 1708 and became the “United Company of Merchants of England Trading to the East Indies.” A document, a detail of which is shown in figure 15.3, dated 1756, is from a license from the United Company to the merchant Joseph Salvador to transport coral, as beads and rough, to Fort St. George and the proceeds to be invested “in Pearls, Diamonds, Diamond Boart, and other precious Stones or Jewels, and in no other Goods whatsoever.” These goods were to be transported back to London on one or more of the United Company’s ships to be “Sold at the said Company’s Candle”—an auction timed by the burning of a certain length of candle. From the later seventeenth century to the nineteenth century, many of the “famous” Indian stones reached the west, including the Pigot, the Agra, the Idol’s Eye, the Nassak, the Arcots, and the Koh-i-Nur. Some, such as the

Pigot, were obtained by senior personages in India, not infrequently in less than clear circumstances, while others, such as the Arcots, were more in the nature of bribes by local rulers hoping to retain or garner the support of British royalty (Ogden 2009; Ogden 2013, 380–81). King George III and his wife, Queen Charlotte, faced significant criticism for the quantity of diamonds they received in this manner and were the subject of some vicious satire in the press. The hand-colored etching in figure 15.4, dated 1788, shows the king and queen along with Warren Hastings, the first governor-general of Bengal, and Edward Thurlow, the lord chancellor of Great Britain, as a demon. Hastings pours diamonds into the royal mouths from a bag inscribed “Indian Plunder.”⁹

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Figure 15.3. (above) Detail of a license for Joseph Salvador to trade for diamonds in India, 1756. Photo: Jack Ogden. Figure 15.4. (facing page) “The diamond eaters, horrid monsters,” a cartoon showing Indian diamonds being poured down the throats of King George III and Queen Charlotte, 1788. Credit: The British Museum, 1968.0808.5740. © The Trustees of the British Museum. All rights reserved. 332

• Eclipse of Indian Diamonds

By the time King George was cruelly lampooned in the press, diamond had been exported, not infrequently looted, from India for more than two millennia. But by then India was being eclipsed by the vast diamond riches of Brazil. Some diamonds may well have found their way from Brazil to Europe prior to 1725, and there were also some diamonds from Borneo, but the huge influx of diamonds from Brazil, coinciding with the growing popularity of the brilliant cut, had a profound and lasting effect on European jewelry. The wealth-generating Industrial Revolution created a perfect market for the stones. Then, little more than a century later, diamonds were discovered in South Africa. These soon came on the markets in even greater numbers than had the Brazil stones. A price crash was to be expected, but with serendipitous timing, the vast new wealth being created in the United States was soon ready to absorb them. This page intentionally left blank

This book has taken the reader on a long journey, from the diamond chips used by lapidaries five hundred years or more before the birth of Christ, to the arrival of diamonds from Brazil more than two millennia later. Through this period, there was a gradual change in the understanding of diamonds, from myth and legend to science, and for the final centuries of this period, the discovery and remarkably rapid development of diamond cutting. However unique and specialized diamond cutting was, it fits within the general context of the technological development that marked the change from medieval to Renaissance Europe. Diamond history has also mirrored the history of trade in general and Epilogue the people and peoples involved in it. By Roman times, overland and coastal sea trade was supplemented by the direct route across the Indian Ocean. Fifteen hundred years later, the opening up of sea lanes from Europe to India and to the newly discovered Americas ushered in two new periods in diamond’s history. The Indian sea trade, tied to the rise of the European trading companies in Asia, greatly increased the use of diamonds in European jewelry; the transatlantic trade, a century later, brought Brazil’s diamond wealth to European markets. There is much still to explore. There are many European archives to scour, and the non-European sources—Armenian, Arabic, Persian, and Indian—will help to redress the inevitable Eurocentric bias of this book. We long to know more of the many non-Europeans who played an essential role in the diamond trade in India, such as the Banian diamond dealer Vogjee Moodasee, who worked with Cholmley, and Mir Muhammad Sayyid, who arrived in Golconda as a horse dealer in about 1590, became a diamond merchant, farmed mines at Kollur in the 1630s, and then rose to high political power (Subrahmanyam 1988). A history of diamonds is also a history of jewelry. Diamonds of any significant size have always taken pride of place in ornament, whether expressing rank or faith or constancy. Smaller

diamonds have served typically as accompaniments for larger gems, whether flanking the pink sapphire in one of the earliest surviving diamond rings—that from Aï Khanoum in what is now Afghanistan (figure 2.1)—or providing the bright little “sparks” in Renaissance jewelry. As early as medieval times, the use in Europe of diamonds in rings apparently associated with love provides a wonderful historic tradition for modern practice. De Beers’ half-century-old slogan “A diamond is forever” may be modern marketing hyperbole, but there seems to be no end of fascination with this king of gems. 336

• Epilogue “A Description of the Diamond Mines” was published in *Philosophical Transactions of the Royal Society of London*, the world’s first scientific journal, in 1677 (Cholmley 1677). It was subsequently also published in *Miscellanea Curiosa: Containing a collection of Curious Travels, Voyages, and Natural Histories of Countries, As they have been Delivered in to the Royal Society*, vol. 3, 1707, printed by W.B. for James and Jeffery Wale, London (pp. 238–55). The handwritten draft, dated 1675, survives in the British Library (Egerton MS 2543 224–29), and apart from some minor spelling variations (mainly in the place names), tidying up of grammar, and the presence of a date, it is the same as the published text. The inscription supposedly left at the Currure mine by a Portuguese diamond miner who struck riches there at the last moment is omitted in the handwritten draft, but space is left for it.

Appendix A 1675 Description of the Diamond Mines
By [P roBAB ly] nA t HA ni E l cH olml E y

Despite being unsigned, the assumption is that the report was written by Nathaniel Cholmley. Nathaniel Cholmley had been in India since 1663, settled in Machilipatnam, the main port in the kingdom of Golconda. He traded in diamonds, a business that was not then engaged in by the East India Company. Nathaniel encountered various problems with the company in the mid- 1660s that included his arrest, but with his brother’s and friends’ help, he was allowed to stay in India and trade in diamonds. In 1670, with the arrival of Sir William Langhorne as the new governor, his status improved, and in 1674 the company gave approval for him to settle at Golconda “by reason of his skill in dyamonds” and to transact business there, but still not actually acting as an agent. From various East India Company documents, we can establish that he was at Machilipatnam in about early September 1675, when he was extremely ill and even tried to kill himself in a fever (Fawcett 1952, 277). He was in Navarazpuram, where he had built a house, in late September 1675, quite recovered, and on 5 November 1675, he was reported to be at the diamond mines and as healthy as he had ever been. He had returned to Machilipatnam by the end of 1675, having completed his business for that year. Thus, the report’s stated 337time and place—Munnemurg (a diamond mining area some 50 miles south of Kurnool), 27 November 1675—is consistent with the author being Cholmley; besides, few other Englishmen would have had the firsthand experience of the mines necessary to compile it. 1

The writer is careful not to imply that he had visited all the mines himself. The facts he gives about the Golconda mines are based on “experience of several of the place I have seen, and the best Informations I could meet with.” He provides more cursory information about the “Bisapore” (Bijapur, modern Vijayapur) mines, and it is possible he had not visited these himself. Ball in his commentary on Tavernier noted the *Philosophical Transactions* article and provided much information about the mines, including comparing and attempting to identify the mines listed by Tavernier and the anonymous writer, who he also presumed to be Nathaniel Cholmley (Ball 1889, 2:352n). A Description of the Diamond-mines, as it was presented by the Right Honourable, the Earl Marshal of England, to the R[oyal] Society. The parts of the world known to contain Diamonds, are the Island Borneo, and the Continent of India extra & intra Gangem: Pegu [Myanmar] is likewise reported to have several; but the King not potent, his country being but thinly inhabited, contents himself with his Mines of

Rubies, Saphires, Topasses, Emeralds, Gold, Silver, Brass, Tinn and Lead, and several other Commodities his Country affords in great plenty, rather than to suffer new enquiries to be made, left the discovery of such an additional Treasure should invite some of his Neighbours, more potent, to invade him. But leaving the description of other places to those that know them better, I shall only keep my self to the Coast of Coromandel, with which I am acquainted, and having visited several of its Mines, am able to say something thereof Experimentally. The Diamond- Mines in these parts are generally adjacent to Rocky Hills or Mountains, whereof begins a great Ledge or Range near Cape Comorin, extending in breadth about 50 English miles, some conjoyning, others scatter'd: and running thence in length quite through Bengala. In, among, and near these Hills in several places, are known to be (as its believed most of them have) Mines; many of them are possessed by petty Princes, or Rajaes, of the Hundues; some driven thither shelter by the Mores, who have taken the greatest part of their Country from them; others never overcome, as the Rajaes, on the Hills and in and near Bengala, who admit of little or no Commerce with their Neighbours or passage through their country, which (being barren, in few places affording good water, the ways craggy and very toylsom, especially to an army) the Moors covet not, but let them enjoy it peaceably; yet to prevent danger, they forbid digging (as the King of Pegu does) or dig some few Mines only very privately, so that a great part of the Mines are unsearched and concealed. But the Kingdoms of Golconda and Visiapore contain in them scope enough of ground, known to have Mines sufficient to furnish all the world plentifully with Diamonds; but their Kings permit digging only in some places appointed, lest, as it is imagined, they should become too common; and withal fear of tempting the threatening greatness of Aurengzebe; forbidding also those places that afford the largest Stones, or else keeping workmen in them for their own private uses: So that but a very small quantity (in comparison of what might be) and those only of ordinary size, are found. In the Kingdom of Golconda (as near as I can gather from the best acquainted) are 23 Mines now employed, or have been so lately, Viz. Quolure, Codawillicul, Malabar, Buttephalem, Ramiah, Gurem, Muttampellee, Currure, Ganjeeconeta, Luttawaar, Jonagerree, Pirai, Dugullee, Purwillee, Anuntapellee, Girregeta, Maarmood, Wazzergerree, Munnemurg, Langumboot, Whootoor, Muddemurg and Melwillee or the New Mine. Quolure was the first Mine made use of in this Kingdom. The Earth is something yellowish, not unlike the colour of our gravel dried; but Appendix • 339 whiter in some places where it bounds with smooth pebbles, much like some of those that come out of our Grave- pits in England. They use to find great quantities in the Vein, if it may properly be so called, the Diamonds not lying in continued Clusters as some imagine, but frequently so very scattering, that sometimes in the space of 1/4 of an Acres of ground, digged between two or three fathoms deep, there hath been nothing found; especially in the Mines that afford great Stones, lying near the superficies of the Earth, and about three fathoms deep; deeper they could not dig for water; it being in a Vale near a River. In other places the Earth is mixt with rugged Stones, where they seldom mine deeper, though in higher ground, before the colour of the Earth alters, and the Vein ceases; which they give a guess at by the small Stones they find in the Earth, the principal guide they have in the discovery of the Mines. The Diamonds found in these Mines are generally well shaped, many of them pointed, and of a good lively white water; but it also produces some yellow ones, some brown, and of other Colours. They are of ordinary sizes, from about six in a Mangelin* (of which they find but few) to five or six Mangelins, each; some of 10, 15, 20 they find but rarely. They have frequently a bright transparent skin, inclining to a greenish colour, though the heart of the Stone be purely white; but the veins of these Mines are almost worn out. T

he Mines of Codawillikul, Malabar, and Buttepallem consist of a reddish Earth, inclining to an orange colour (with which it stains the clothes of the labourers that work in it) they dig about four fathom deep. They afford Stones generally of an excellent water and crystalline skin; smaller sizes than those of Quolure, Ramiah, Gurem, and Muttempellee: have a yellowish Earth, like Quolure; their Stones like those of the two former Mines, but mixt with many of a blew water. These five Mines being under the same Government with Melwillee, where the Governour resides; He (to draw the Adventures and Mer* A Mangelin is four grains in weight, saith Linschoten. 340 •

Appendixchants near him, that he may be better informed of the actions and advantages, and know the better how to fleece them, the general practice of Governours in these parts) has very lately forbid their use; and commanded all to repair to his Residence, which they must obey, or f lie into another Government. The next Mine in our way is Currure, the most famous of them all and most ancient. It has been under subjection of the King of Golconda; but about 25 years, taken, with the Country of Karnaticum, from the Hendue- Rajaes, ab out that time, by the Nabob, Meer, Jumla. In it have been found Diamonds of a seize weight which is about 9 ounces Troy or 811/2 Pago's weight. It is only employed by the King for his own private use: The Diamonds that are found in it, are very well spread, large Stones (it yields few or none small,) they have generally a bright skin, which inclines to a pale greenish colour, but within are purely white. The Soyl is reddish as many of the others. About sixty or seventy years ago, when it was under the Government of the Hundues, and several persons permitted to adventure in digging, a Portugeez Gentleman went thither from Goa, and having spent in Mining a great sum of money to the amounts of 100000 Pago's, as 'tis reported, and converted every thing he bought with him, that would fetch any money, even to what wearing clothes he could spare, while the Miners were at work for the last days expence, he had prepared a cup of Poyson, resolving if that night he found nothing, to drink his last with the conclusion of his money; but in the Evening the Workmen brought him a very fair Spread Stone of 20 Pago's weight, in commemoration whereof he caused a great Stone to be erected in the place, with an inscription engraven on it, in the Hundues or Telling a Tongue, to the following effect, which remains to be seen to this day; Your Wife and children sell, sell what you have, Spare not your Clothes, nay, make your self a Slave; But money get, then to currur E make hast; The re search the Mines, a prize you'l find at last Appendix

• 341After which he immediately returned with his Stone to Goa. Not far from Currure are the Mines of Lattawaar and Ganjeeconta, which are in the same Soyl as Currure, and afford Stones not unlike: But Lattawaar hath many representing the great end of a Razor- blade, thin on one side and thick on the other, very white and of an excellent water; but the best of the Mine is worn out, and Ganjeeconta employed only to the Kings private use. Jonagerre, Pirai, Dugulle, Purwillee and Anuntapellee consist also of Red earth, are now employed, and afford many large Stones; part of them a greenish water; but the most absolute Mines are of Wazzergerre and Munnemurg (the other rather representing Pits than Mines), for there they sink through high Rocks till they go far below their basis, that they can go no further for water, in some places 40 or 50 fathom deep. The superficies of the Rocks consist of hard, firm, white Stone, into which they cut a Pit like a Well, of about 4 and 5, in some places 6 foot deep, before they come to a crust of a mineral Stone, like the Mineral of Iron; when they fill the Hole with Wood and keep as hot fire as they can there for 2 or 3 days, till they think it sufficiently heated; then they pour- in water till they have quencht it, which also f lakes and mollifies both Stone and Mineral; both being cold, they dig again, take out all the crumbled stuff and dig up what they can besides, before they heat at anew; the crust seldom is thicker than 3 or 4 foot, which creasing, they come to a vein of Earth, that usually runs under the

Rock 2 or 3 furlongs; sometimes much further: This they dig all out and search, and if their first attempt prove successful they go to work again (digging after the same manner) as deep as they can, till they come to water: for the drawing whereof, wanting the help of Engins, known in Europe, they can go no deeper, although the Vein lie lower; all lumps of the Mineral they break in pieces, and frequently find Diamonds enclosed in them. To work on these Mines is very expensive, but the advantage is commonly answerable; yet in respect of the certain disburse, that must be before any thing be found, they are 342 • Appendix not so much frequented as others, where they may try their fortunes with a smaller stock. The Earth they dig out is red: Many large Stones are found here; the smallest about 6 in a mangelleen. They are mixt waters, but the greatest part good, only of ill-flavoured shapes, many cragged pieces of stones, some as if they had been parts of very great ones, others with pieces broken off them; yet I never heard of any that found two seeming fellows, although they do those that look as if they had been newly broken. In Langumboot they dig as they do at Wazzergerrec and Munnemurg; the Rock is not altogether so solid, but the Earth and Stones it produces much alike. Wootoor should have been placed next to Currure, it lying near it, and affording Stones of a like magnitude, shapes and waters; 'tis employed only to the Kings use: And singular, in that its Diamonds are found in black Earth. Muddemurg far exceeds all the rest for Diamonds of a delicate shape, water, and bright transparent skin, proud, as it were, in discovering their inward beauties, with which no other Mine can compare; yet it has also store of Veiny ones, but those likewise of so curious shape and water, that is difficult to discover than from the good, especially the small ones. It produces Stones of divers magnitudes, from 10 and 12 in a mangelleen, to 6 or 7 magelleens [sic] each, and besides, some great ones. The Earth is red, but it's seated in the Woods, and the water so bad, that to all (except the people bred there) it presently occasions Feavers & destroys abundance, in so much that most of the Adventurers have forsaken it; notwithstanding which it hath been more profitable than any of the rest, the Vein frequently lying near the superficies of the Earth, seldom running deep, and is better furnisht than any other yet discover'd. The River Kishna, of excellent waters, is but 9 miles distant; but the Miners or Merchants are either poor that they cannot, or else overawed by the Governour, pretend to be and dare not be at the charges of fetching their water from thence. Divers are of Appendix • 343 opinion, that, besides the Water, the Town lying in a bottom, environ'd with Hills and Morass adjoining, the Air may have been infected, and contribute to its unhealthfulness. Melwillee or the New Mine, so called, because it was but lately found out (or at least permitted to be made use of) in the year 1670; it had then a year employed the Miners, but it was forbidden and lay unoccupied till 1673, when complaint being made at Couleur, that the Vein was worn out, the King again licensed its settlement. The Earth they mine in, is very red, and many of the Stones found there have of it sticking to them, as if it had clung there while they were of a soft glutinous substance and had not attained their hardness, maintaining its colour on its skin (seeming to be roughned with it) that it cannot be fetcht out by grinding on a rough Stone with sand, which they make use of to clean them. The Stones are generally well shaped, their size from 5 or 6 in a mangelleen to those of 14 or 15 each, and some bigger; but greatest quantities of the middle sorts: Most of them have a thick dull skin, incline to a yellowish water, not altogether so strong & lively as of the other Mines; very few of them of a crystallin water & skin. They are reported to be apt to flaw in splitting, which occasions these people to esteem them something softer than the product of many of the other Mines: several that flatter by their seeming whiteness when rough, discover their deceitfulness having passed the Mill, and too often a yellowish tincture, to the disappointment and loss of them that

have cut them: but what they want in goodness, is in part supplied by the plenty they find, which, together with their properties, make them the cheaper. This being what I have gathered, both by experience of several of the place I have seen, and the best Informations I could meet with, of the Mines in this Kingdom: I shall now proceed to those in Visiapore. Visiapore is known to contain Mines enclosing Stones as large and good as those of Golconda; but the King, for reasons already given, makes use but of the meanest: whereby, as Golconda is famous for the largeness of those it affords, Visiapore is noted for the smallest; whose 344 • Appendix Mines, though they seldom or never render an Adventurer a fortune or estate at once, as sometimes those of Golconda do, by a great Stone or several found together; yet they are more populous and better employed, the small Stones lying thicker in the earth, so that the generality are gainers, and few but that get their expence; whereas those of Golconda dig away a considerable Estate and find nothing, others not their charges, and where one is a gainer, divers lose. There are 15 Mines employed in the Kingdom of Visiapore, viz Ramulconeta, Banugunapellee, Pendekull, Moodawarum, Cumerwillee, Paulkull, Workull, Lungeepoleur, Pootloor, Punchelingull, Shingarrampent, Tonarpaar, Gundepellee, Donee and Gazerpellee. In Ramulconeta Mines in red Earth, about 15 or 16 foot deep, they seldom find a Diamond of a mangelleen weight, but small to 20 or 30 in a mangelleen. They are generally of an excellent crystalline water, have a bright clear skin, inclining frequently to a pale greenish colour, are well shaped, but few of them pointed ones. There are also found amongst them several broken pieces of Diamonds, by the Country people called Shemboes. In Banugunnapellee, Pendekull and Moodawarum, they dig as at Ramulconeta, and in the same kind of Earth; they also afford Stones much alike, being neighbouring places. Cumerwillee, Panukull, and Workull, are not far distant, produce Stones much alike out of the same coloured Earth, but very small ones even to a 100 in a mangelleen. Lungepoleur Mines are of a yellowish Earth (like those of Quoleur,) its Diamonds are generally well shaped, globular, few pointed, of a very good crystalline water and bright skins; many of them have a thick dark grass-green skin, some spotted also with black, that they seem all foul, yet are not so, but within purely white and clean. Their sizes are from 2 or 3 mangelleens downwards, but few very small. Pootloor Mines are of reddish Earth, but afford Stones much like those of Lungepoleur, only smaller, under a mangelleen; the general sizes are of 1/2, 1/3, 1/4, 1/6 of a mangelleen. Appendix • 345 Punchelingull, Shingarrampent, and Tondarpaar, are also of red Earth, their Diamonds not unlike those of Quoleur, only rarely or never any large ones are found there. Gundepellee hath the same Earth with the former, and produces Stones of equal magnitude; but frequently of a pure crystalline water, wherein they exceed the former. Donee and Gazerpellee dig both in red Earth likewise, and afford Stones alike, the greatest part whereof are of good shapes and waters. They have also many Shemboes, and some of bad waters. Some brown, which these people call soft or weak water'd, being esteemed of a softer and weaker body than others, by reason they have not so much life, when cut, and are subject to flaw in splitting, and on the Mill; their general product is in Stones of middle sizes: But Gazerpellee has besides many large ones, and is the only Mine noted for such in the Kingdom of Vijiapore. With which concluding the description of the Mines, I shall give some account, how the Diamonds are found, and how they handle the Earth to find them; which is as followeth: The Diamonds are so scattered and dispersed in the Earth, and lie so thin, that in the most plentiful Mines its rare to find one in digging, or till they have prepared the stuff, and do search purposely for them: They are also frequently enclosed in Clods; and some of those of Melwillee, the New Mine in the Kingdom of Golconda, have the Earth to fix about them, that till they grind them on a rough Stone with sand, they cannot move it

sufficiently, to discover they are transparent; or, were it not for their shapes, to know them from other Stones. At the first opening of the Mine, the unskilful Labourers, sometimes to try what they have found, lay them on a great Stone, and striking on them with another, to their costly experience discover they had broken a Diamond. One I knew had an excellent Stone of 8 magelleens [sic], served so by ignorant Miners he employed. Near the place where they dig, they raise a Wall with such rugged Stones as they find at hand (whereof all the Mines afford plenty) of 346 •

Appendix about 2 foot high, and six foot over, flooring it well with the same; for the laying of which they have no other Mortar than the Earth tampered with Water. To strengthen and make it tight they throw up a bank against the side of it: In one whereof they leave a small vent about two inches from the bottom, by which it empties itself into a little pit, made in the earth to receive small Stones, if by chance any should run through. The vent being stopped, they fill the Cistern they have made with water, soaking therein as much of the Earth they dig out of the Mines, as it can conveniently receive at a time, breaking the clods, picking out the great stones and stirring it out with shovels, till the water is all muddy, the gravelly stuff falling to the bottom; then they open the vent, letting out the foul water and supplying it with clean, till all the Earthy substance be wasted away, and none but a gravelly remains at the bottom. Thus they continue washing till about 10 of the Clock before Noon, when they take the gravelly stuff they have washed, and spread it on a place made plain and smooth (like a Bowling- alley) for the purpose, near the Cistern, which being soon dried by the heat of the Sun at that time of the day, they very curiously look it over, that the smallest bit of a stone can hardly escape them. They never examine the stuff they have washed but between the hours of ten and three, least any cloud by interposing intercept the brisk beams of the Sun, which they hold very necessary to assist them in their search; the Diamonds, not forbearing to reflect them when they touch therein, rendering themselves thereby the more conspicuous. Some of the expertest Labourers are employed in searching; he that sets them at work usually sitting by, and looking; but its hardly possible, especially where many are employed, to watch them so narrowly, but that they may steal part of what they find, as many times some of them do, and selling it privately, convert to their own life. If they find a large Stone, they carry it not presently to their Employer, but keep on looking, having an eye on him till they observe he takes notice of it, when with a turn of their hand they give him a glimpse of it, but deAppendix • 347 liver it not till they have done work, and then very privately, it being the general endeavour to conceal what they find, least it should come to the knowledge of the Governour of the place, and he require a share, which in the Kingdom of Golconda is usually practiced, without respect to any agreement made with them. The Miners, those that employ them, and the Merchants that buy the Stones of them, are generally Ethnicks; not a Mussleman, that ever I heard of, followed the employment. These Labourers and their Employers are Tellinga's, commonly Natives of or near the place. The Merchants are the Banians of Guzzarat, who for some Generations have forsaken their own Country to take up the Trade, in which they have had such success, that 'tis now solely engross'd by them: who corresponding with their Countrymen in Surrat, Goa, Golconda, Vijiapore, Agra and Dillee, and other places in India, furnish them all with Diamonds. The Governours of the Mines are also Idolaters: In the King of Golcondas Dominions a Tellinga Brammee rents most of them, whose agreement with the Adventurer is, that all the Stones they find under a* Pagoda weight, are to be their own; all of that weight and above it to be his, for the Kings use: But although this Agreement be signed and sealed unto, he minds not at all the performance thereof, but endeavours to engross all the profit to himself by tyrannical squeezing both Merchant & Miners, whom he not only taxes very high, but maintaining Spies among

them of their own people, on the least inkling that they have been any ways fortunate he immediately makes a demand on them, and raises their Tax; else, on a false pretence they have found a great Stone, drubs them till they surrender what they have, to redeem their bodies from torment. Besides, the Excise is so high on all sorts of Provisions, Beetle, and Tabacco, which to them is as absolutely necessary as Meat, or at least in their esteem, that it is thereby raised to * A Pagoda weighs 9 mangelleens. 348 • Appendixdouble that price they bear without the Government; and it is furnisht only by some Licens'd persons; if any other should endeavour to bring in the least quantity by stealth, he is fined (even for one leaf of Tobacco) if it be person of any repute or worth any thing, else severely drub'd for it; by which course there is hardly a man worth 500l to be found amongst them, most of them dealing by Moneys taken up at Interest of Usurers, who reside there purposely to furnish them, who, with the Governour eat up their gains: for that one would wonder any of them should stay, and not betake themselves to place where they might have better usage; as there are several in other Governments, and some few that have the sense to remove; but many their Debts, others hopes of a great hit detains. Both Merchant and Miner go generally naked, only a porr Clout about their middle, and a Shash on their heads; they dare not wear a Coat, lest the Governour should say they have thriven so much, are rich, and so inlarge his Diamonds on them. The wisest, when they find a great Stone, conceal it till they have an opportunity, and then with Wife and Children run all away into the Visiapore Country, where they are secure. T he Government in the Visiapore Country is better, their Agreement observe'd. Taxes easier, and no such impositions on provisions; the Merchants go handsomely clad, amongst whom are several persons of considerable Estates, which they are permitted to enjoy peaceably, by reason whereof their Mines are much more populous and better employed than those of Golconda. It is observable, that notwithstanding the Agreement with the Adventurers of the Mines, that all Stones above a certain weight shall be for the Kings use; yet in the Metropolis of either Kingdom, as the Cities of Golconda and Visiapore are, there is no seizure, all Stones are free; and the late deceased King, Abdull Cutopshaw of the former, and Edelshaw of the latter, would not only give very great prizes for large Stones, but richly vest and present the Merchant that sold them with Horses or something else of value, thereby encouraging others Appendix • 349to bring the like. But the present King of Visiapore is a Child, and the King of Golconda's delights solely pleaded on light Women- dancers, and Tricksh ewers, that he neither minds Diamonds, nor many things more necessary, committing the Government of his Kingdom to a Tellinga Braminee, which the Mussleman not well resenting, does in some measure threaten the stability of his State.