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GOLD
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I. IN PRE-ISLAMIC PERSIA

The principal periods of gold production in pre-Islamic Persia occur in the late second and early first millennia B.C.E., during the Achaemenid period (6th-4th cent. B.C.E.), and in the early first millennium C.E. While the archaeological record can be uneven, cuneiform and Classical documents provide additional information on certain periods.

Persia possesses a number of gold sources within its borders; at times, gold resources from outside Persia were also important to production. Gold sources in Afghanistan are located in Badaḵšān, which is also the source region for lapis lazuli and, possibly, tin (Stech and Pigott, pp. 45-46). The gold of the Āmu Daryā (q.v.) lies just north of Afghanistan in ancient Bactria. Within Persia itself, gold deposits occur in the northwest (Azarbaijan and Zanjān: Bariand, pp. 19-20), near Kāšān at the western edge of the central plateau (Wertime, pp. 329-30), and, according to Strabo (*Geography* 15.2.14), in Kermān. The gold-producing land of Harali, mentioned in cuneiform sources from Mesopotamia,

may correspond to the northwestern regions, or may extend into territories northeast of Persia (Komoróczy, pp. 113-23; Reiter, pp. 10-11). The 8th-century Neo-Assyrian king Tiglath-Pileser III received tribute in gold from the "provinces of the Medes," perhaps referring to the Zanjān sources (Moorey, p. 220; Forbes, p. 150). The legendary land of Aratta, to which Sumerian kings turned for precious metals and stones (according to the Enmerkar legend), may be identified with Šahr-e Suḵta, close to the eastern border of Persia (Sauren, p. 143; for an alternative view, see Majidzadeh, 1976, 1982).

The earliest gold objects so far discovered in Persia consist largely of items of foil-covered jewelry, found mostly within tombs of the late fourth millennium in western Persia and Kermān, at a time of intercultural contact with Mesopotamia (Late Uruk period, 3500-3200 B.C.E.) and of increasing political centralization (Tallon, pp. 241 ff.; Amiet, 1985, p. 300; Johnson, p. 127; Dittmann, p. 348; Chase, Caldwell and Fehérvári, p. 188). A small, dog-shaped pendant from Susa represents the earliest-known cast gold object and solder from Persia (Tallon, p. 265). The discovery of gold in a small number of graves, including the burials of children (de Mecquenen, p. 17), indicates a degree of social differentiation in the developing towns of southwestern Persia.

In the Proto-Elamite phase (3100-2600 B.C.E.), gold occurred at such widely separated sites as Tall-i Malyan (Tall-e Maliān, Fārs), Tepe Sialk (western edge of the barren central plateau), and Tepe Hissar (Tappa Ḥeṣār), Level II (northeastern Persia). During this period of political independence and extensive economic contacts, gold was restricted to a few sites. The forms were limited to jewelry (beads and earrings) and a leopard in relief, found at Tall-i Malyan (Sumner, p. 106). After this, in the period contemporary to Mesopotamian Early Dynastic III (2600-2350 B.C.E.), gold objects appeared only at Tepe Hissar (Level IIIB) and Susa (Period 4A). The objects from Susa included an electrum ring, possibly manufactured through a deliberate process of alloying (Tallon, p. 256). The Hissar finds, in turn, attest to the use of gold for larger items: vessels of hammered sheet gold, found alongside the more prevalent ornaments (Schmidt, p. 164). At both sites, these items appeared in non-funerary contexts, suggesting an expansion in gold's function.

During the period contemporary with the Old Akkadian kings of Mesopotamia (2334-2193 B.C.E.), when western Persia was subject to periodic raids and political pressures from the west, the only gold finds occurred at Susa (Period 4B; Tallon, pp. 81, 249). Rimuš, the second king of the Old Akkadian dynasty,

claimed to have captured “30 mina of gold” (approximately 15 kg) in a raid on Elam and Barahšum (Gelb and Kienast, pp. 205 ff.). At the end of the third millennium, western Persia regained political power in the hands of the kings of Šimaški and Elam. At Susa, a number of graves of this period contained gold and electrum jewelry (de Mecquenem, passim); in addition, a bronze figurine of a god preserved gold foil on one hand (though it once may have covered his face as well; Amiet, 1966, figs. 1, 234). Elsewhere, gold was concentrated at sites in the northeast, including Tepe Hissar (Level IIIC), with a cache of gold jewelry and weapon accessories (Schmidt, pp. 198-210). The “Astrabad Treasure,” a collection of gold vessels and weapons said to have come from nearby Tureng Tepe (Turang Tappa) in Gorgān (Rostovseff, p. 4), exhibits iconography and forms related to local ceramics, Sumerian art, and the “Fullol Hoard” from Afghanistan (Tosi and Wardak, pp. 9-17).

After the early second millennium, gold production declined in Persia, to be revived only in the thirteenth century. In Ḵuzestān and Fārs, this renewal took place under the Middle Elamite kings, who established a number of political and cult centers. At Susa were discovered a pair of figurines representing male worshippers with goats, one of gold or electrum, the other of silver (Porada, p. 62). Middle Elamite texts recovered at Haft Tepe and Malyan (Anshan, q.v.) recorded the use of gold and silver in temple and funerary contexts (Carter and Stolper, pp. 34, 42).

Middle Elamite production in gold was modest, however, compared to that of the northwestern region, where local gold sources supplied a lively regional workshop style. The manufacture of gold vessels and jewelry here persisted from the late second millennium into the eighth and seventh centuries. This northern region was subject to a range of cultural influences; the local population appears to have been aware of Hurrian and local Zagros traditions (some perhaps proto-Median), but gold items show the influence of Elamite and Assyrian iconography as well (Porada, pp. 90-134). A number of the finds from this region were acquired on the antiquities market, subjecting their stated provenance to close scrutiny (Muscarella, p. 216). At the site of Marlik (Mārlik), on the northern slopes of the Alborz, over fifty tombs were thought to have held the remains of local rulers. The main period is assigned to the thirteenth to twelfth centuries, but burials continued into at least the ninth century (Maxwell-Hyslop, pp. 189-97). The gold items consisted largely of jewelry, often possessing repoussé, granulated, cloisonné, openwork, and plated designs (Maxwell-Hyslop, pp. 189-97). Even more distinctive are the

vessels, with animal motifs such as serpents, rams, horses, bulls, winged bulls, and other *Mischwesen* “mixed creatures” (Porada, pp. 90-94). The gold and gilded jewelry and vessels said to be from Ziwiye (Zivia, located 100 km southeast of Lake Urmia) may have dated to the seventh century; they also suggest connections with Scythia, Assyria, and Urartu (Godard, pp. 11 ff.; Maxwell-Hyslop, p. 206; but see Muscarella, pp. 197 ff. for a rigorous and balanced assessment of the value of the Ziwiye items to a historical or art historical understanding of the region). Hurrian influence was also postulated for certain features of the gold bowl from Hasanlu (Ḥasanlu), with its mythological figural scenes. While Edith Porada (p. 101) assigned this extraordinary vessel to the late second millennium, I. J. Winter (pp. 90-92) has suggested that it belonged to the period of the ninth-century destruction. Other precious materials from the same level at Hasanlu included a gold-plated sword hilt, and a silver goblet with electrum plating (Porada, pp. 110-18).

In pre-Achaemenid southwestern Persia, special note may be taken of an elaborate armlet of about 600 B.C.E. from a Neo-Elamite tomb at Arrajān (q.v.; Majidzadeh, 1992, p. 131). The Achaemenid Persian kings left textual documentation of the origin and uses of gold under their patronage. According to Herodotus (*Histories* 3.94-102), these kings received tribute in gold from India, as well as gifts or tribute from Lydia, Ethiopia, Libya, and Thrace. This gold they put to a variety of uses, including coinage, weaponry, ornament, furniture, and vessels. In general, little Persian gold has been discovered archeologically in well-provenanced finds from Persia itself (the exceptions being discoveries at Susa [de Miroschedji, pp. 181-94] and Pasargadae [Stronach, pp. 168-77]). Lion motifs appear in profusion on the jewelry and vessels of the period, as they do also in the relief sculpture (Porada, pp. 170, 172, 162; Amandry, pp. 10-13). Contemporary to and slightly later than this material is Achaemenid-style goldwork among the contents of the Oxus Treasure. This collection of precious objects, discovered in 1877 in Tajikistan near the Oxus River, comes from an uncertain context and includes items dating (according to stylistic criteria) to the 5th through the 2nd century B.C.E. The earlier, Achaemenid items originally included gold figurines, clothing attachments, plaques with embossed human figures, jewelry, gilded silver vessels, and at least two gold chariot models (Dalton, pp. 1-41). Slightly later in date are gold objects from six graves excavated at nearby Tella (Tillya) Teppe. The excavator attributes these mostly female burials to Kushan royalty of the 1st century C.E. and points out the mix of styles (Greco-Bactrian, Scythyo-Sarmatian, East Persian, and Roman) incorporated in the burial gifts

(Sarianidi, pp. 53-54). The bodies in these graves were covered in multiple layers of garments with sewn-on gold ornaments and surrounded by gold jewelry (earings, hair pins, crowns, rings, necklaces, bracelets, and anklets), vessels, and, in the case of the single male burial, with gold-ornamented parade weapons and horse gear (Sarianidi, pp. 19-52).

During the Parthian and Sasanian dynasties, in the period from the third century B.C.E. to the seventh century C.E., goldsmiths continued to create objects for the royal court. Parthian finds came from the region of the western Alborz mountains, predominantly in the form of jewelry (Vanden Berghe, pp. 133-36; Ackermann, pp. 459-70). Contemporary observers reported on the finery displayed in the Sasanian court, such as silk carpets run through with gold thread, and gold furniture (Porada, pp. 197, 201). Few archaeological discoveries have confirmed these accounts; what does remain of Sasanian gold work consists mainly of gilded silver plates and bowls, with figural designs (Porada, pp. 214-17; Ghirshman, pp. 203-5; Harper, p. 24 ff.). Tests have revealed that the Sasanian smiths practiced mercury-gilding (Lechtman, pp. 10-14); they plated either the designs or the background of the silver vessels with gold. While Sasanian gold work shows some relationship to Achaemenid models, its distinctive influence extended eastward to China and India and westward to Europe as well (Ghirshman, pp. 283, 298).

Plate I. Gold bracelet with lion heads and crouching lion cubs. Ziwiye (Kurdistan), 7th century B.C.E. 2.5 inches wide × 3.625 in. diameter; 254 g. Tehran, Iran Bastan Museum.

Plate II. Gold cup with three lions. Kalār Dašt (Māzandarān), 8th-7th century. B.C.E. 4.875 in. h. × 4.5 in. diameter; 238 g. Tehran, Iran Bastan Museum.

Plate III. Gold bowl with name of Xerxes in trilingual inscription. Hamadān (?), 5th century B.C.E. 4.5 inches h. × 8 inches diameter; 1.407 kg. Tehran, Iran Bastan Museum.

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(Jennifer C. Ross)

II. IN THE ISLAMIC PERIOD

Gold was found in large areas of greater Iran in early Islamic times (Allan, 1979, Table 4, pp. 111-13), especially in the rivers and mountains of Transoxiana. Farḡāna, including Aḵsikaṯ (qq.v.), Nasyā, and Noqād (Ebn Ḥawqal, p. 515), was particularly rich and has remained an important source of gold into the 20th century. So too, the Hindu Kush, the Pamirs, Ḡarčestān (q.v.), and Zābolestān are also recorded as having had gold mines. One gold mining site, perhaps Sasanian or early Islamic, in Afghanistan has been visited and briefly described: Zarkašān, midway between Kabul and Qandahār

(Tylecote, p. 286).

Within the boundaries of modern Persia, James Mactear located the gold mine known as Kuh-e Zar near Dāmḡān (q.v.; Mactear, pp. 25-27). The existence of a gold mine at Dāmḡān is mentioned by Abu Dolaf Yanbuʿi (q.v.; p. 25, tr. p. 57) and Abu'l-Qāsem Kāšāni (q.v.; p. 216). The Tal-i-Iblis Expedition visited the gold mines at Muta, not far from Golpāyagān (q.v), in 1966. This is probably identical with Taymara (Wertime, pp. 327-30; Pleiner, pp. 342-47). Modern surveys also confirm that gold occurs in Kermān province, near Jiroft (Harrison p. 516), and in the Jebāl province, near Zanjān (Mactear, pp. 27-29; Harrison, pp. 514-15).

Comparison of the distribution of gold resources with 10th century mint towns shows that while some mints, such as the one at Samarqand, were near a gold source, others, like those in Ḵuzestān and Fārs, were a long way away from the nearest mine. Some gold evidently travelled long distances within the country. Gold may also have been imported into Islamic Persia: from West Africa, via Yemen or Basra; from upper Egypt, through the Indian Ocean trade; and from Sumatra (Allan, 1979, pp. 5-6). Persia probably exported gold to Baghdad from Taymara, situated close to the great Hamadān-Baghdad trade route through the Zagros.

Abu Dolaf and Biruni (q.v.) record finds of large nuggets of native gold, but these would rarely have formed a significant proportion of the gold in circulation. The latter was either mined as tiny particles of gold in a rock matrix or extracted from rivers. In the former instance, the gold-bearing rock would be taken out of the mine in chunks, broken by hand and then crushed in a mill (Biruni, pp. 233-34; Kāšāni, p. 216). The crushed mixture of gold and rock would then be sifted and separated by water, and the gold extracted from any impurities left by amalgamation. The nugget of gold left after vaporisation of the mercury was called *ḏahab zeʾbaqi* or *ḏahab mozabbaq* (Biruni, p. 235).

Alluvial gold was usually extracted by panning, often by the traditional use of sheepskins (Ebn Ḵordāḏbeh, p. 179; Ṭusi, p. 212). Biruni records a more unusual method of collecting it, by filling holes dug in the river bed with mercury (Biruni, p. 236).

The nugget of gold left after amalgamation and vaporisation of the mercury was further purified by melting, a process termed *taʿriq* by Abu Moḥammad Ḥasan b. Aḥmad Hamdāni (fol. 27b, p. 155), who gives a detailed description of

the process (chap. 11, pp. 154-65). On melting, any impurities in the gold came to the surface to form a scum (*qelimiā-ye zar*taʿriq. In the first, the gold was melted with charcoal in a large crucible, and in this case the impurities remained underneath, a second melting being necessary after regrinding; in the second, a small goldsmith's crucible was used, and the dross came to the surface and could be run off by means of a flux such as borax (fols. 28b-29a, pp. 159-61). After purification the gold was hammered out and cut into thin strips ready for a second purification process, cementation, to remove the silver content naturally occurring in gold. This process was termed *ṭabḵ* or *taṣʿīd* (Hamdāni, chap. 12, pp. 165-83). The gold was arranged inside a crucible in layers alternating with the cementation compound (*dawāʾ*). According to Hamdāni, this compound consisted of pyrites, salt, and baked brick, pounded up and sifted; Kāšāni gives a recipe of one part salt, two parts baked brick, and four parts white clay (p. 221). It is clear that Hamdāni's recipe is a combination of two different processes for extracting silver from gold: the salt process and the sulphur process, whereas that of Kāšāni is the former process alone. Among the types of pyrites (*zāj*) which Hamdāni specifies (fol. 31a, p. 169) is *al-zāj al-abyaż al-martaki*, literally white lead sulphate. The presence of lead during cementation would allow the silver sulphide or chloride to be removed in a lead regulus after the sulphur or salt had reacted with the silver in the gold.

Persian goldsmiths and jewellers, like their forbears, would have used gold containing small amounts of copper and silver for most of their work (Hamdāni, fols. 28a, 71b-72a; pp. 157, 331-33). They would also have varied the color of the gold by the addition of other metals or substances. The two best known metal colorants are copper for red and silver for white, and the variations possible with these two metals were evidently well-known to the craftsmen, for Hamdāni (fol. 28a, p. 157) identifies *ṭib* as a gold-silver-copper alloy used by jewellers, and discusses a similar alloy for use as a gold solder, while Biruni mentions red gold (*al-ḏahab al-aḥmar*) and a naturally occurring green gold (p. 233). In the time of Kāšāni, however, there were many recipes for coloring gold. He records nine (Kāšāni, p. 217-19; Allan, 1979, pp. 9-10):

1. Black gold: add copper to molten gold.

2. White gold: add silver to molten gold.

3. Yellow gold: add sulphur to molten gold.

4. Red gold: add malachite to molten gold.

5. Red gold: take five dirham *sang* (*dramsang*) of verdigris, twenty of Bukhari (*Boḵāri*) clay, salammoniac, two dirhams (*drams*) of salt; pound, sift, and dissolve it in water, then paint it onto the gold and fire it and wash it.

6. Unspecified color: take ten dirhams of silver, two of salt, one-half of yellow arsenic; pound, sift, and moisten the mixture and spread it on the gold and polish it.

7. Red gold: take ten dirhams of yellow sulphur, twenty of salt, forty of white clay; pound the mixture, sift it onto the surface of the gold, and polish it.

8. Green gold: take ten dirhams of verdigris, ten of salammoniac, ten of white clay, one-half of white unbaked brick, two of salt; pound it, sift it onto the surface of the gold, and polish it.

9. Colorful hue: ten dirhams of salammoniac, ten of burnt copper, twenty of burnt *borma*, one of salt; put it lightly pounded into a stone cauldron, warm it and mix it with the gold.

There are two different techniques here for coloring gold. In one (recipes nos. 1-4 and 9) the coloring substance is actually mixed into the molten gold; in the other, only the surface of the cooled gold is affected. A still more complicated technique is probably alluded to by Abu Dolaf in his description of the various types of gold found at Šiz (Abu Dolaf, p. 2; tr. p. 31). Here he mentions that *sejājabaḏi* gold can be colored with *zāj*, which is iron sulphate (Allan, 1979, p. 81). Experiments to reproduce gold with a rose-colored surface such as is found in ancient Egypt have shown that this color can be made by mixing gold containing silver and copper with iron pyrites and soda (Lucas p. 234; Plenderleith and Warner, p. 215), and it is probably to this that he alludes.

In addition to recipes for coloring gold, the texts also give recipes for making gold solders. Hamdāni gives a single recipe (fols. 68b-69a, pp. 319-321): one dirham of gold, four *ḥabba* of copper, and one *ḥabba* of silver (equivalent to 48/53 gold, 4/53 copper, 1/53 silver). Kāšāni gives two other recipes, one for red gold and one for white gold: four *dāng* of gold, one *dāng* of copper and one *dāng* of silver for red gold, and half a *dinār* of gold, half a *dāng* of silver and half a *dāng* of copper for white gold (Kāšāni, p. 221-22), the latter equivalent to 6:1:1 (Allan, 1979, pp. 10-11). The use of borax as a flux is attested by Ebn Ḥawqal, Kāšāni, and Yāqut.

Gold was also used for gilding other materials or metals. It was usually applied in leaf or foil form or, in the case of metals, with mercury (Hamdāni, fols. 63a-64a, 66a-67a; pp. 297-301, 309-13). On one or two Islamic silver objects, the method used for gilding can be clearly seen. For example, the gilding on the bowl commemorating the capture of two rebels in 1144 C.E. (Sauvaget, Sarre and Martin, pl. 122) goes far beyond its rightful areas, indicating that it is mercury gilded.

Gold was sometimes used as an inlay on objects made of brass or other copper alloys. Most surviving examples date from the Il-khanid and Timurid periods. It was also used as an inlay or overlay on objects made of steel (e.g. Allan and Gilmour, pp. 557-58).

Although there is evidence for large-scale production of gold objects for court use in the Timurid and Safavid periods (Grube, pp. 252-53; Allan, 1995, pp. 124-25), surviving pieces are few. An outstanding example from a much earlier period is a Buyid gold vessel in the Freer Gallery of Art, made for Abu Manṣur Baḵtiār (Atil et al., p. 266). On the other hand, relatively large quantities of gold jewellery items survive, for example, rings (Wenzel, pp. 60-87).

Turning to goldsmithing trades, Sasanian craftsmen included the *asēmgar* and *asēm-paykar*, both silversmiths, and the *zarigar* and *zarrēn-paykar*, both goldsmiths (Tafazzoli, p. 193, 196). Ahmad Tafazzoli suggests that one group of smiths must have made ornaments and the other vessels and larger objects; he offers the names *nāzok-kār* and *koloft-kār* as the modern equivalents (Tafazzoli, p. 196). In the 20th century, Hans E. Wulff noted that although in small communities a goldsmith might be the only worker in precious metals, large cities had separate goldsmithing, silversmithing, and jewellery trades, together with particular specialists like the embosser, fretworker, gold-beater, wire-drawer, and gold-lace spinner (Wulff, pp. 32-47). The textual evidence supports this type of specialisation in early Islamic times. Thus Hamdāni talks of the general work of the goldsmith (*ṣāʾeḡ*), but also (fol. 63a-b, pp. 297-99) notes the fineness of gold leaf and the skill required to make it and says that it was the particular and exclusive trade of the Jewish community in Baghdad. He also mentions the use of gold thread in clothes (fol. 63a), and since numerous Persian manufacturing centers for such garments are mentioned in the sources, e.g., Šuštar, Fasā, Tawwaj, Isfahan, Saraḵs etc. (Serjeant, 1943 pp. 74, 80, 82, 84; 1946, pp. 102-3, 107, 109, 117, 119), there must have been craftsmen completely devoted to gold lace production to meet this demand. It is reasonable to suppose that other specialisations existed too, e.g., gold wire

drawers and gilders. Certainly this was so in late 19th century Isfahan, for which Mirzā Ḥosayn Khan records the following guilds: goldlace workers, jewellers, gold-wire drawers, gold brocade weavers, goldlace spinners, goldsmiths, gold engravers and inlayers in ivory, embossers who inlaid gold into other materials, and gilders (apud Floor, pp. 83, 87-89, 101, 105, 115).

Plate IV. Gold bracelet. Persia, Saljuq dynasty, 11th-12th century. Gold, 10.6 cm. diameter. Courtesy of the Freer Gallery of Art, Smithsonian Institution, Washington, D.C. Purchase, F1958.6.

Primary sources: Abu Dolaf Yanbuʿi, *al-Resāla al-ṯāniya*, ed. and tr. Vladimir Minorsky as *Abu-Dulaf Misʿar Ibn Muhalhil's Travels in Iran*, Cairo, 1955.

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