

## EXCAVATIONS AT MA'LAYBA AND SABIR, REPUBLIC OF YEMEN: RADIOCARBON DATINGS IN THE PERIOD 1900 TO 800 CAL BC

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**ABSTRACT.** The Bronze and Iron Age cultures in Yemen have no parallels to the well dated cultures in the Syro-Palestinian region. Radiocarbon datings are therefore exceptionally important for the Yemenite archaeological excavation sites of Ma'layba and Sabir, the latter being the largest excavation site of the Sabir culture. Dating series were done in order to determine the architectural development of the sites and find time marks for the ceramic development. Sample materials were dated from the 2nd and 1st millennium before Christ. The <sup>14</sup>C dating results allow statements about the cultural development in Ma'layba and Sabir as well as a comparison with the development of other regions in the surrounding, independent of only sparse available archaeological parallels.

### INTRODUCTION

Since 1994, the joint German-Russian expedition has provided evidence for a hitherto unknown pre-Islamic archaeological complex in the hinterland of Aden (Republic of Yemen). At present, this Sabir Culture appears restricted to the southern Saudi Tihama and to Yemen's coastal plains along the Red Sea and the western Gulf of Aden. During its later stages it overlaps chronologically with the much better known South Arabian Civilisation which starts to appear along the desert fringes of Ramlat as-Sab'atayn and the High Yemen as early as the 12th century BC. Cultural exchange between coast and interior appears limited and long distance relations with cultures beyond South West Arabia (Pre-Axumite North East Africa/Levante) cannot be used for the reconstruction of chronological framework.

The two most important stratified sites of the Sabir Culture are Ma'layba and Sabir in the Lahj Governorate (Figure 1). Partial congruencies of their inventories make them suitable for the definition of an emerging cultural sequence that can now be dated by 35 radiocarbon dates.

The settlement of Ma'layba is a relatively small *tell* at the southern edge of the al-Hawta/Lahj oasis some 20 km north of the port of Aden. In a deep sounding its total stratigraphic sequence with about 6 m of cultural layers could be studied. Anthropogenic deposits start almost immediately above two superimposed paleosols that elsewhere in Yemen are attributed to the 6th and the 4th millennia BC. Stratified dwelling architecture has survived only as posthole patterns and burnt pole remains of huts alternating with layers of agricultural fields and irrigation channels. Associated ceramics reflect the distinction of two major periods: a long and early period I divided into phases Ia through c, and a shorter period II after which the site was obviously abandoned.

### METHODS

Chemical pretreatment of wood and charcoal samples was done by AAA treatment (Mook and Streurman 1983). The dating was performed with gas proportional counters of the Houtermans-Oeschger type, using methane at 133.3 kPa pressure as filling gas. Measurement control and data processing were done using computers (Görtsdorf 1990; Görtsdorf and Bojadziew 1996). Since 1997 (Bln-4977), modern electronics have been used. The preamplifier, pulse amplifier, comparator,

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pulse shaper, and anti-coincidence units are located in a box (19cm x 10cm x 5cm), which is directly connected to the counter. The detection of variation of the environmental radiation and the inspection of the long time stability of the electronics were required in order to reach the measurement accuracy (Görsdorf 2000). The  $\delta^{13}\text{C}$  measurements were done at the Leibniz-Labor, University of Kiel, Germany and are reported in permil relative to PDB-standard.

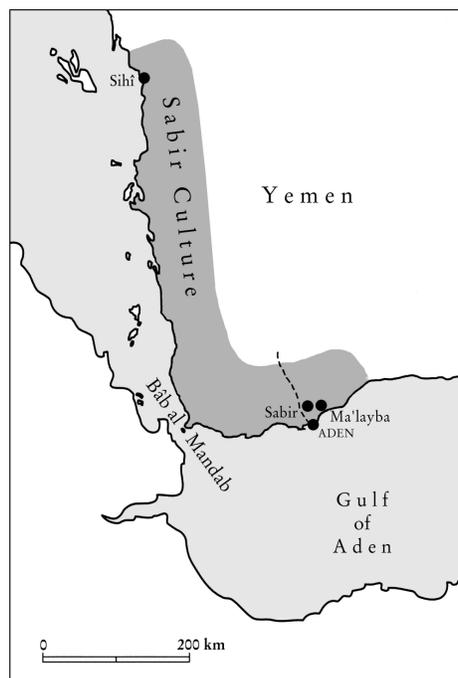


Figure 1 Map of the surroundings of Sabir and Ma'layba

## RESULTS

The results with sample numbers, site names, and dating materials are shown in Tables 1 and 2 for Ma'layba and Sabir, respectively. We show the  $^{14}\text{C}$  ages in BP, rounded off to the nearest 5. The datings are corrected for isotopic fractionation using the measured  $\delta^{13}\text{C}$  values. The  $^{14}\text{C}$  ages are calibrated using the program OxCal v3.5 (Ramsey 1995, 2000) and employing the decadal calibration curve (Stuiver et al. 1998) as a first approximation for all samples. The tree ring count of the charcoal samples could not be determined. The calibration intervals were presented for a confidence of 68.2% and are rounded off to 10 years.

Table 1 Summary of dating results from Ma'layba and Sabir 2/2A

| Lab no.<br>Sample<br>material | Sample number, Site name  | $\delta^{13}\text{C}$ (‰) | $^{14}\text{C}$ age (BP) | Calibrated range<br>$1\sigma$ (68.2%)  |
|-------------------------------|---|---------------------------|--------------------------|--|
| Bln-5148<br>Charcoal          | Ma'layba II; ML97/1, trench extension,<br>Loc. 1, H. 50.00, burnt wooden post | -25.3                     | 3010 $\pm$ 35            | 1370–1340 cal BC<br>1320–1210 cal BC<br>1200–1190 cal BC<br>1140–1130 cal BC |

Table 1 Summary of dating results from Ma'layba and Sabir 2/2A (Continued)

| Lab no.<br>Sample<br>material | Sample number, Site name   | $\delta^{13}\text{C}$ (‰) | $^{14}\text{C}$ age (BP) | Calibrated range<br>$1\sigma$ (68,2%)  |
|-------------------------------|--|---------------------------|--------------------------|--|
| Bln-5150<br>Charcoal          | Ma'layba Ic; ML97/3, area H,<br>Loc. 9; H. 48.90   | -26.1                     | 3005 $\pm$ 30            | 1370–1360 cal BC<br>1320–1210 cal BC<br>1200–1190 cal BC<br>1180–1160 cal BC<br>1140–1130 cal BC |
| Bln-5149<br>Charcoal          | Ma'layba Ic; ML97/2, trench extension,<br>area D, Loc. 14; H. 48.62  | -25.2                     | 3305 $\pm$ 35            | 1620–1520 cal BC   |
| Bln-5151<br>Charcoal          | Ma'layba Ic; ML97/4, area I-J;<br>Loc. 20; H. 48.25  | -25.5                     | 3290 $\pm$ 35            | 1620–1520 cal BC   |
| Bln-5152<br>Charcoal          | Ma'layba Ic; ML97/5, trench extension,<br>area F; Loc. 22; H. 47.98  | -26.6                     | 3330 $\pm$ 35            | 1690–1580 cal BC<br>1570–1520 cal BC   |
| Bln-5153<br>Charcoal          | Ma'layba Ic; ML97/6, area H;<br>Loc. 56; H. 47.52  | -26.2                     | 3245 $\pm$ 30            | 1600–1570 cal BC<br>1530–1440 cal BC   |
| Bln-5154<br>Charcoal          | Ma'layba Ib; ML97/7, trench extension,<br>area D, Loc. 24; H. 47.67 / 47.47,<br>burnt wooden post          | -26.3                     | 3405 $\pm$ 35            | 1750–1680 cal BC<br>1670–1630 cal BC   |
| Bln-5155<br>Charcoal          | Ma'layba Ia; ML97/8, trench extension,<br>area B; Loc. 31; H. 47.16 / 46.96,<br>standing burnt wooden post | -26.1                     | 3455 $\pm$ 40            | 1880–1840 cal BC<br>1820–1790 cal BC<br>1780–1730 cal BC<br>1720–1690 cal BC                     |
| Bln-5156<br>Charcoal          | Ma'layba Ia; ML97/10, trench extension,<br>area B, Loc. 49; H. 46.73 / 46.47;<br>fireplace                 | -25.8                     | 3550 $\pm$ 35            | 1950–1870 cal BC<br>1850–1810 cal BC<br>1800–1770 cal BC   |
| Bln-4631<br>Charcoal          | Sabir 2, pit 2; Sab93/3, mud brickwall,<br>in front of Loc. 4  | -11.0                     | 2845 $\pm$ 40            | 1050–920 cal BC  |
| Bln-4632<br>Charcoal          | Sabir 2, pit 2; Sab93/4, upper ash-layer<br>in Loc. 6  | -19.9                     | 2910 $\pm$ 40            | 1210–1200 cal BC<br>1190–1170 cal BC<br>1160–1140 cal BC<br>1130–1010 cal BC                     |
| Bln-4633<br>Charcoal          | Sabir 2, pit 2; Sab93/6, 3. ash-layer<br>in Loc. 6   |                           | 3030 $\pm$ 50            | 1390–1250 cal BC<br>1240–1210 cal BC<br>1200–1190 cal BC<br>1140–1130 cal BC                     |
| Bln 4630<br>Charcoal          | Sabir 2A=Sabir 2, pit 1; Sab93/1, Loc. 1   |                           | 2820 $\pm$ 60            | 1050–890 cal BC<br>880–860 cal BC  |

Table 1 Summary of dating results from Ma'layba and Sabir 2/2A (*Continued*)

| Lab no.<br>Sample<br>material | Sample number, Site name   | $\delta^{13}\text{C}$ (‰) | $^{14}\text{C}$ age (BP) | Calibrated range<br>$1\sigma$ (68,2%)              |
|-------------------------------|----------------------------|---------------------------|--------------------------|--|
| Bln 4883<br>Charcoal          | Sabir 2A; Sab95/1, Loc. 3  | -15.0                     | 2765 $\pm$ 40            | 970–950 cal BC<br>930–890 cal BC<br>880–830 cal BC |
| Bln 4884<br>Charcoal          | Sabir 2A; Sab95/2, Loc. 18 | -25.8                     | 2730 $\pm$ 35            | 900–830 cal BC                                     |
| Bln 4885<br>Charcoal          | Sabir 2A; Sab95/3, Loc. 22 | -26.0                     | 2835 $\pm$ 40            | 1050–920 cal BC                                    |
| Bln 4886<br>Charcoal          | Sabir 2A; Sab95/4, Loc. 33 | -26.8                     | 2840 $\pm$ 30            | 1040–1030 cal BC<br>1020–920 cal BC                |
| Bln 4887<br>Charcoal          | Sabir 2A; Sab95/5, Loc. 42 | -24.9                     | 2875 $\pm$ 35            | 1130–990 cal BC                                    |

Table 2 Summary of dating results from Sabir 5 (building 1, 2, 3) and Sabir 8A

| Lab no.,<br>Sample<br>material,<br>Site | Sample number, Location   | $\delta^{13}\text{C}$ (‰) | $^{14}\text{C}$ age (BP) | Calibrated range<br>$1\sigma$ (68,2%)               |
|---|---|---------------------------|--------------------------|---|
| Bln-4727<br>Charcoal<br>Sabir 5         | Sab94/95-1, building 2, kitchen area, fireplace with pot V1 in room 1, on the uppermost floor, Loc. 3, H. 49.94                   |                           | 2775 $\pm$ 45            | 980–890 cal BC<br>880–830 cal BC                    |
| Bln-4728<br>Charcoal<br>Sabir 5         | Sab94/95-2, building 2, kitchen area, NE-corner of the room 1, layer above uppermost floor, H. 50.12                              | -25.4                     | 2885 $\pm$ 35            | 1130–1000 cal BC                                    |
| Bln-4729<br>Charcoal<br>Sabir 5         | Sab94/95-3, building 2, kitchen area, fireplace in passage between rooms 1 and 2, layer above uppermost floor, H. 50.11, Loc. 3-4 | -16.1                     | 2775 $\pm$ 40            | 980–950 cal BC<br>940–890 cal BC<br>880–830 cal BC  |
| Bln-4730<br>Charcoal<br>Sabir 5         | Sab94/95-4, building 1, courtyard, layer above uppermost floor, Loc. 18, H. 50.03   | -25.9                     | 2840 $\pm$ 40            | 1050–920 cal BC                                     |
| Bln-4731<br>Charcoal<br>Sabir 5         | Sab94/95-5, building 2, kitchen area, room 1, above lower floor, Loc. 46  | -26.2                     | 2695 $\pm$ 40            | 900–870 cal BC<br>860–800 cal BC                    |
| Bln-4888<br>Charcoal<br>Sabir 5         | Sab95/6, building 2, courtyard, layer above lowest settlement horizon, earliest settlement of 5A, Loc. 52                         | -25.9                     | 2965 $\pm$ 35            | 1260–1120 cal BC                                    |
| Bln-4889<br>Charcoal<br>Sabir 5         | Sab95/7, building 3, uppermost layer, destruction of building 3, H. 48.93   | -26.0                     | 2785 $\pm$ 40            | 1000–890 cal BC<br>880–860 cal BC<br>850–840 cal BC |

Table 2 Summary of dating results from Sabir 5 (building 1, 2, 3) and Sabir 8A (*Continued*)

| Lab no.,<br>Sample<br>material,<br>Site | Sample number, Location   | $\delta^{13}\text{C}$ (‰) | $^{14}\text{C}$ age (BP) | Calibrated range<br>$1\sigma$ (68,2%)                    |
|---|---|---------------------------|--------------------------|--|
| Bln-4890<br>Charcoal<br>Sabir 5         | Sab95/8, building 3, room 3, Loc. 5/Loc. 14, H. 49.10, dating of skeleton and destruction of building 3     | -23.9                     | 2815 $\pm$ 40            | 1010–900 cal BC  |
| Bln-4891<br>Charcoal<br>Sabir 5         | Sab95/9, building 3, Loc. 4, vessel contents of V41, H. ca. 48.80, dating of the destruction of the deposit | -25.8                     | 2760 $\pm$ 35            | 970–960 cal BC<br>930–890 cal BC<br>880–830 cal BC       |
| Bln-5093<br>Charcoal<br>Sabir 5         | Sab96-1, Sabir 5c, east of room 5, Loc. 53  | -24.5                     | 2905 $\pm$ 35            | 1190–1180 cal BC<br>1150–1140 cal BC<br>1130–1010 cal BC |
| Bln-4892<br>Charcoal<br>Sabir 8A        | Sab94/11, Loc. 4 extension, ca. H. 46.70  | -25.6                     | 2840 $\pm$ 35            | 1050–920 cal BC  |
| Bln-4893<br>Charcoal<br>Sabir 8A        | Sab94/12, Loc. 6 East-extension, H. 46.22   | -23.8                     | 2835 $\pm$ 30            | 1020–920 cal BC  |
| Bln-4894<br>Charcoal<br>Sabir 8A        | Sab94/13, Loc. 9A, beginning of the pottery sequence under the building, ca. 1m under the surface           | -25.2                     | 2965 $\pm$ 35            | 1260–1120 cal BC   |
| Bln 4895<br>Charcoal<br>Sabir 8A        | Sab94/14, Loc. 9B, H. 46.21   | -24.4                     | 2885 $\pm$ 40            | 1190–1180 cal BC<br>1130–1000 cal BC                     |
| Bln-4896<br>Charcoal<br>Sabir 8A        | Sab94/15, Loc. 9C, H. 45.52   | -24.9                     | 2975 $\pm$ 40            | 1290–1280 cal BC<br>1270–1120 cal BC                     |

## DISCUSSION

The calibrated dates from Ma'layba seem reliable. Thus, the series dates an early phase of the coastal culture—more precisely the seven centuries before the main occupation of the key and type site Sabir. The stratigraphic distinction of two major occupations at Ma'layba is confirmed, and moreover, the parallel ceramic development mainly during period I is corroborated.

Almost all samples relate to period I and to its phases a-c assigning them to the 20th to 13th century BC<sup>3</sup>. Period Ma'layba II, represented solely by sample Bln-5148, starts during the 14th/13th century BC—a time when Ma'layba pottery was completely identical to productions from Sabir. Regarding the stratigraphically older sample Bln-5150 and its associated period Ic pottery, it is highly likely that the dividing line between the two periods needs to be drawn right through the 13th century BC.

<sup>3</sup>Note that the stratigraphically earliest sample has not yet been submitted for AMS dating but a late 3rd mill. BC date is to be expected since this sample was collected 50 cm beneath sample Bln-5156.

The end of period II and the end of the Ma'layba settlement is unclear but may antedate the appearance of solid architecture in Sabir not later than the 12th century BC.

An important by-product is the corrected dating of the remains of irrigation channels to the beginning of the 2nd millennium BC down to about the 16th century BC. Both samples Bln-5152 and Bln-5153 provide a *terminus ante quem* for their operation.

The type-site Sabir, just 5 km west of Ma'layba, is a major urban centre and, by far, the largest ruin of the Sabir Culture. Several smaller elevations can be made out on the surface hardly exceeding 3 m and imperceptibly passing over into the alluvial plain. Excavation trenches, laid out in far distant locations, are rather extensive and mostly—although not exclusively—devoted to the top cultural deposits. Recently, dug wells, modern construction pits, and the deep soundings of Sabir 2C and Sabir 8A show that the depth of the anthropogenic layers is 5–6 m in average.

Two different kinds of architecture can be distinguished: the lower strata as well as what is presently considered the periphery of Sabir are marked by the postholes of hut-dwellings of a round, sometimes rectangular plan. Better detectable mudbrick constructions, farmsteads, and residential buildings cluster in central locations usually close to the surface. Especially worth mentioning is Sabir 5—certainly a ritual or politico-economic infrasite center. This general picture is supplemented by sanctuaries and several workshop areas for manufacturing personal ornaments, bone tools, bronze melting, and ceramics production.

As obscure as the stratigraphic beginnings of the settlement are, so unclear is also its end: an extremely dense deflation pavement of potsherds on the surface originates perhaps from several occupation layers once overlying the mudbrick ruins. They may indicate a re-occupation just before the armies of successive South Arabian kingdoms campaigned into the Wadi Tuban Delta and established their rule certainly not later than the middle of the 1st mill. BC. No material traces of these early kingdoms have been recorded from Sabir and its immediate surroundings yet.

One of the smallest, although chronologically most important excavation trenches is that of Sabir 8A encircling a small square mudbrick building of  $3.5 \times 3.5$  m<sup>2</sup>. On its exterior a small deep sounding was started from the bottom end of the mudbrick wall producing a sequence of nine cultural layers as far down as 4.5 m below the surface. No further mudbrick structures could be traced but stratified pottery was found, as known already from both period II and late period I at Ma'layba. <sup>14</sup>C samples date the construction of the small building around the late 12th century BC.

Sabir 2 is an elevation mainly known for its unusually high quantity of broken vessels and potsherds. This includes also a very high amount of overfired fragments that can altogether be associated with a number of successive pottery kilns tested in sounding Sabir 2C. Without reaching virgin soil the nearby trenches of Sabir 2 *pit* 2 (5 <sup>14</sup>C samples) and Sabir 2A (5 <sup>14</sup>C samples) yielded evidence for layers both without recognizable architectural remains and strata with mudbrick foundations antedating, respectively accompanying the operation of the kilns and making a functional connection between the buildings and the pottery workshops very likely.

In itself, the series of <sup>14</sup>C-datings is conclusive. Pottery production goes back to the 11th/10th century BC and is apparently responsible for the fast accumulation of the refuse and the other cultural layers. The earliest deposits, unrelated to the pottery manufacture, date to the 14th or 13th century BC—a period roughly contemporary with period I and II at Ma'layba—the earliest mudbrick walls date to not earlier than the 12th century BC and the combustion of a related timber construction (Bln-4884) to the early 9th century BC.

Sample LE-4941 coming from the topmost layer of *pit 2*,<sup>4</sup> requires a comment: its calibrated dating somewhere between the 8th and the 6th century BC (with a wide standard deviation) has only one parallel in Sabir, i.e. in sample Bln-4731 from building 2 in Sabir 5 (see below). Although an incidental deposition of sample LE-4941 cannot be excluded *a priori* (such as the campfire of a shepherd), it is more likely to be associated to a re-occupation of the site, the evidence of which has survived only in the form of the dense deflation pavement.

Sabir 5, the most extensive excavation trench in Sabir, comprises the foundations of a vast monumental mudbrick complex with clear signs of planning which emphasizes its representative, public function. Its high outer wall enclosed a trapezoidal precinct of more than 5000 m<sup>2</sup> surface with two diametrically opposed entrances. During its occupation the compound underwent several major architectural alterations to which several sub-phases and associated occupation levels can be added. Of prime interest within the context of <sup>14</sup>C dating are the buildings 1, 2, and 3 (and their vast adjoining courtyards), the foundations of which can be considered contemporary with the construction of the enclosure wall. All of these were constructed on top of earlier deposits without architecture. The basic component of buildings 1 to 3 are hypostyles with two, respectively, three naves. The naves of buildings 1 and 2 were later transformed into small open courtyards. Buildings 1 and 2 are supplemented by several subsidiary rooms, building 3 by a forecourt.

Nine samples come from Sabir 5 that is stratigraphically associated with the earliest occupation (Bln-4888), the transformation into small internal courtyards (Bln-4730), the overlying occupations (Bln-4727-4729), and the final destruction of building 3 (Bln-4889-4891).

Within this series from Sabir 5, sample Bln-4731 with a date from the 9th century BC is clearly too young especially when compared to its stratigraphic position. Although a disturbance in the building's 2 kitchen annex has not been recorded during excavation, this <sup>14</sup>C date can be considered uncontaminated and therefore reliable. The sample may, in fact, originate from one of those numerous pits dug into the top debris layer after a major destruction, ruining, and temporary abandonment of the Sabir 5 area. It may reflect the same re-occupation of the site as already suggested through the 8th to 6th century BC sample LE-4941 from Sabir 2.

The earliest occupation of Sabir 5 buildings 1 and 2 can reliably be dated to around the 12th century BC—a date that, with reference to architectural observations, can be applied also to building 3 and the entire trapezoidal enclosure wall. While there is evidence that a final occupation of the two buildings dates probably from the early 10th century BC, building 3 obviously attests to a different and later end: much care was invested in the regular layout of the building that with its forecourt and lateral court galleries somehow recalls the plan of South Arabian temples. The building's inventory, mainly pottery, is largely different from that of all other contemporary structures underlining its outstanding significance. Archaeologically, it is also important for a couple of other findings: A brick red color of the walls and a thick layer of mudbrick debris all over the place attest a heavy conflagration (see Bln-4889). The attached store, fully packed with empty vessels and many others still containing plenty of botanical remains (Bln-4891), was buried directly under carbonized mat weaving and burnt timber. Behind the central platform of the forecourt a human skeleton was discovered, documenting the fate of an individual apparently killed by the collapsing and burning roof (Bln-4890). These three samples overlap chronologically near the end of the 10th century BC, giving testimony of a violent end.

<sup>4</sup>The two samples LE-4940: 3040 ± 40 BP and LE-4941: 2520 ± 100 BP, originally marked with the cyrillic letters LE (= Leningrad), were kindly processed in the St Petersburg Radiocarbon Laboratory, Russia. We are grateful for the permission to publish these dates here.

## CONCLUSIONS

With the results of the German-Russian field work in the Lahj Governorate and beyond the Hadramawt and Ramlat as-Sab'atayn desert belt, the westerly coastal plains have entered the scene as the third major cultural province of Ancient Southwest Arabia (Vogt 1998, 2000; Vogt and Sedov 1998, 2000). This applies both to the prehistoric and the proto-historic periods.

The Sabir Culture, represented here by the sites of Ma'layba and Sabir, is rooted in a Bronze Age tradition that continues well into later periods. Manifesting itself in monumental mudbrick architecture, developed centralized political structures, and sophisticated irrigation schemes, the culture reaches its final though short climax basically just before its disappearance, i.e. by about the 12th century BC. Elsewhere in the Ancient Near East this is the period of an advanced Early Iron Age.

Evaluating the  $^{14}\text{C}$  sequence, the end may not have been as fast and sudden as previously assumed. Conflagrations were a frequent phenomenon but even the major destruction (of Sabir 5 building 3) by about the late 10th century was certainly not the ultimate end. Sabir did definitely not recover but somehow agonized for several more generations. Unproven by archaeological evidence, although not unlikely, the end came perhaps through the hands of the Sabaeans (by about 700 BC) or slightly later with the establishment of the rule of the kingdom of Qataban.

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