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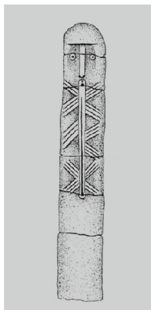

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Article outline

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THE GIANT STELAE OF AKSUM IN THE LIGHT OF THE 1999 EXCAVATIONS

Bertrand POISSONNIER

Abstract

Excavations were carried out in 1999 on the location of Stela 2 at the ancient site of Aksum in northern Ethiopia. These excavations have permitted the documentation of the foundation of this stela, which was transported to Rome in 1937. Preparations were also made for the stela's return to the site in 2005 and its re-erection in 2008 at the exact location where it stood in the 3rd or 4th century AD. The excavations also made it possible to re-examine our perception of the three giant stelae on the site, from their conception and erection to their destruction.

Keywords

Aksum, Ethiopia, archaeology, stelae (monoliths), Stela 2 from Aksum, megalithism.

1 - Introduction

At the heart of the main stelae field in the town of Aksum (figures 1-3), among a number of undecorated stelae, a group of six bear similar decorations evoking multi-storey buildings (figures 4-9). A seventh stela seems to be a poor copy of the six others (figure 10); an eighth bears unique decoration made of a sort of box installed on top of a column capital and whose meaning is disputed (figure 11). As far as we can tell, the lower part of the great multi-storey stelae is rough-hewn, leaving an incomplete surface over a variable length (around one tenth of the total length). This part was therefore most probably hidden from view. Once upright, the stela was fastened in a vertical position by two notched slabs which to some extent clamped the stela: these are the "base plates". It has been assumed that these plates lay on the ground of the period, and the visible height of the monoliths has been deduced from their position. Prior to our intervention, therefore, the equation "visible height = length of the decorated part" was globally accepted. The multi-storey stelae, particularly stelae 1, 2 and 3 which have received particular attention up to the present, are dated indirectly to the 3rd or 4th century AD (Phillipson, 2000). They have been considered as markers of royal graves and thus form part of a funerary assemblage including numerous hypogean structures (Munro-Hay, 1989). Here, we suggest (figure 12) a connection not previously considered between these multi-storey stelae at Aksum and some extremely old and unfortunately poorly dated defensive towers which are encountered in the southwest of Saudi Arabia, particularly in the Asir highlands (Mauger, 2001). The analogies are striking; in particular the presence of a vertical projection which protected the entrance door (itself identical to those of the stelae, down to the detail of the door handle) from the top of the tower... Were the stelae erected close to the graves also intended to protect them?

Figure 1 – General view of the stelae field, facing west. Photograph taken in 1906. Note the great Stela 3, on the left of the image (after Littmann *et al*., 1913).

Figure 2 – General view of the stelae field facing south. Photograph taken in the early 20th century. The large stela in the centre of the image is Stela 3, seen from the back (B. Poissonnier collection).

Figure 3 – View of the western part of the stelae field. Stela 2 has just been re-erected and is surrounded by a temporary metal structure. Stela 3 is guyed (photograph: B. Poissonnier, 2008).

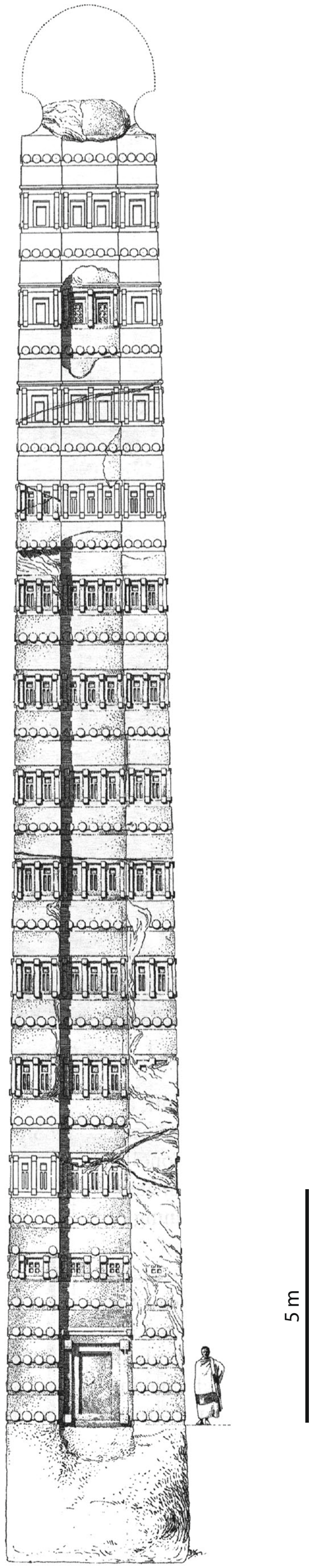

Figure 4 – Stela 1. Fallen and broken, its extremity is missing; it was originally 32.60 m high and weighed 517 tonnes (after Littmann *et al*., 1913).

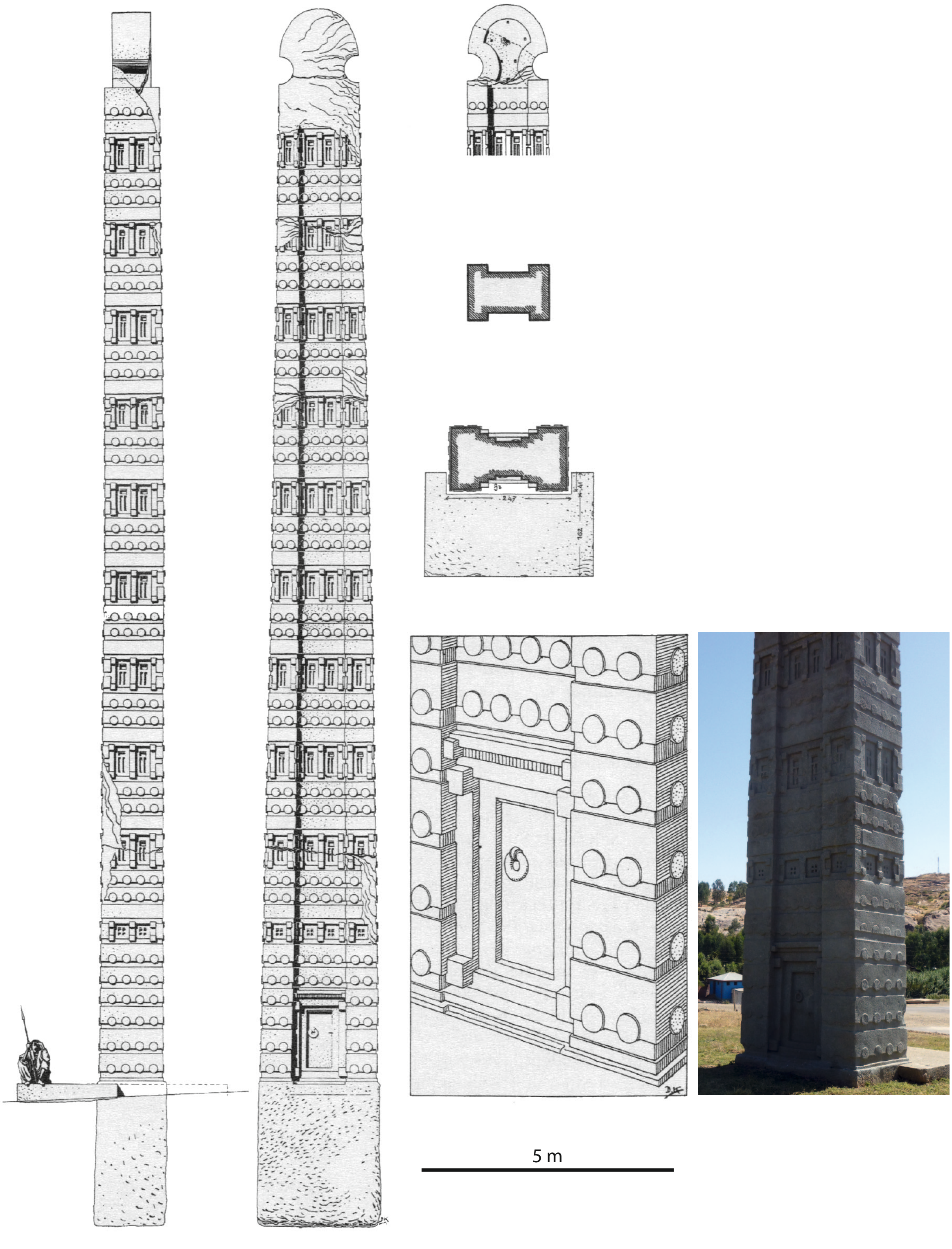

Figure 5 – Stela 2. Fallen and broken, then reconstructed and re-erected in Rome in 1937, then once again dismantled, returned to Aksum in 2005, rebuilt and re-erected in 2008: 24.60 m high and with a weight of 170 tonnes (drawing: after Littmann *et al*., 1913; photograph: A. Daussy, 2011).

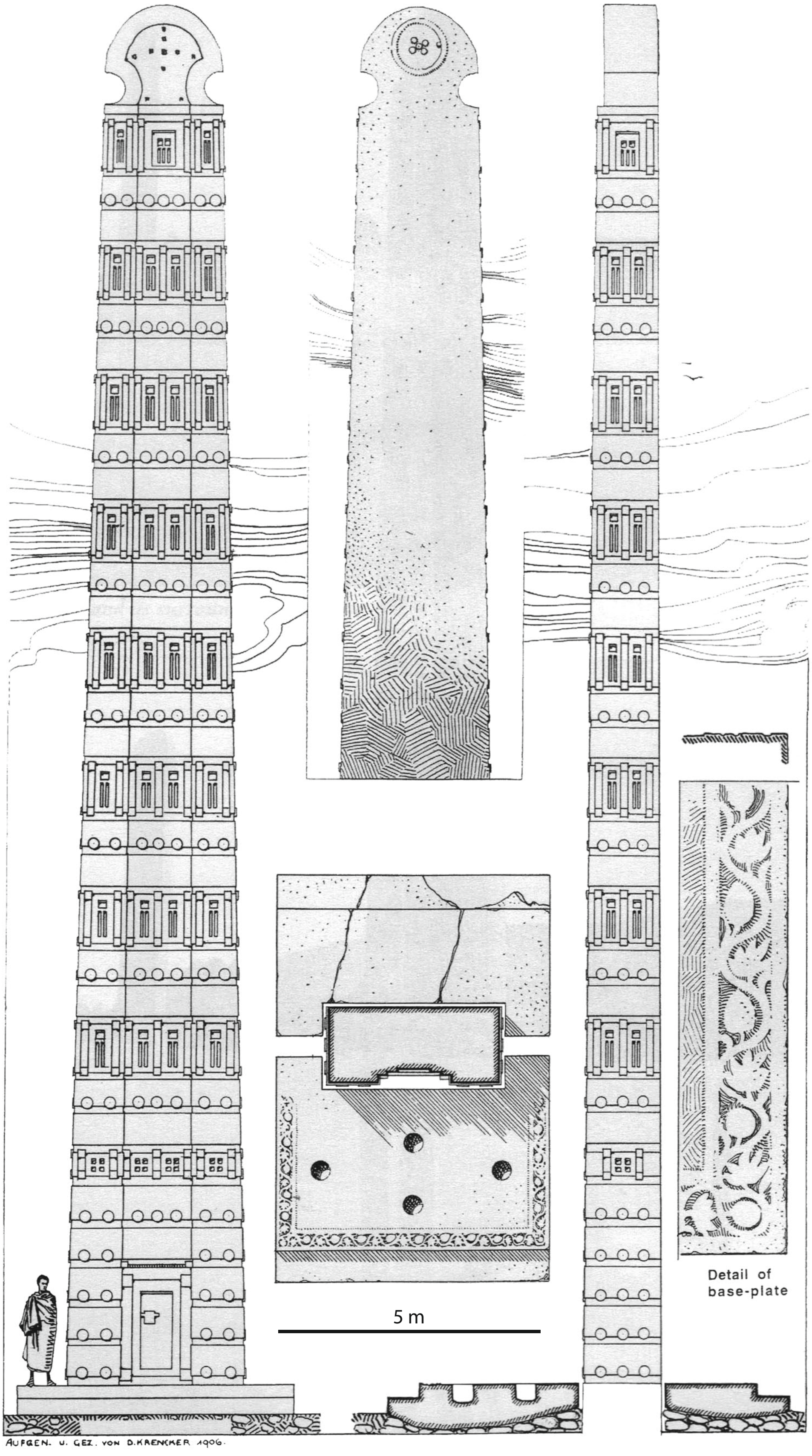

Figure 6 – Stela 3: 1906 drawing. The only stela to have remained upright: 20.60 m above ground and with a weight of 160 tonnes (after Littmann *et al.*, 1913).

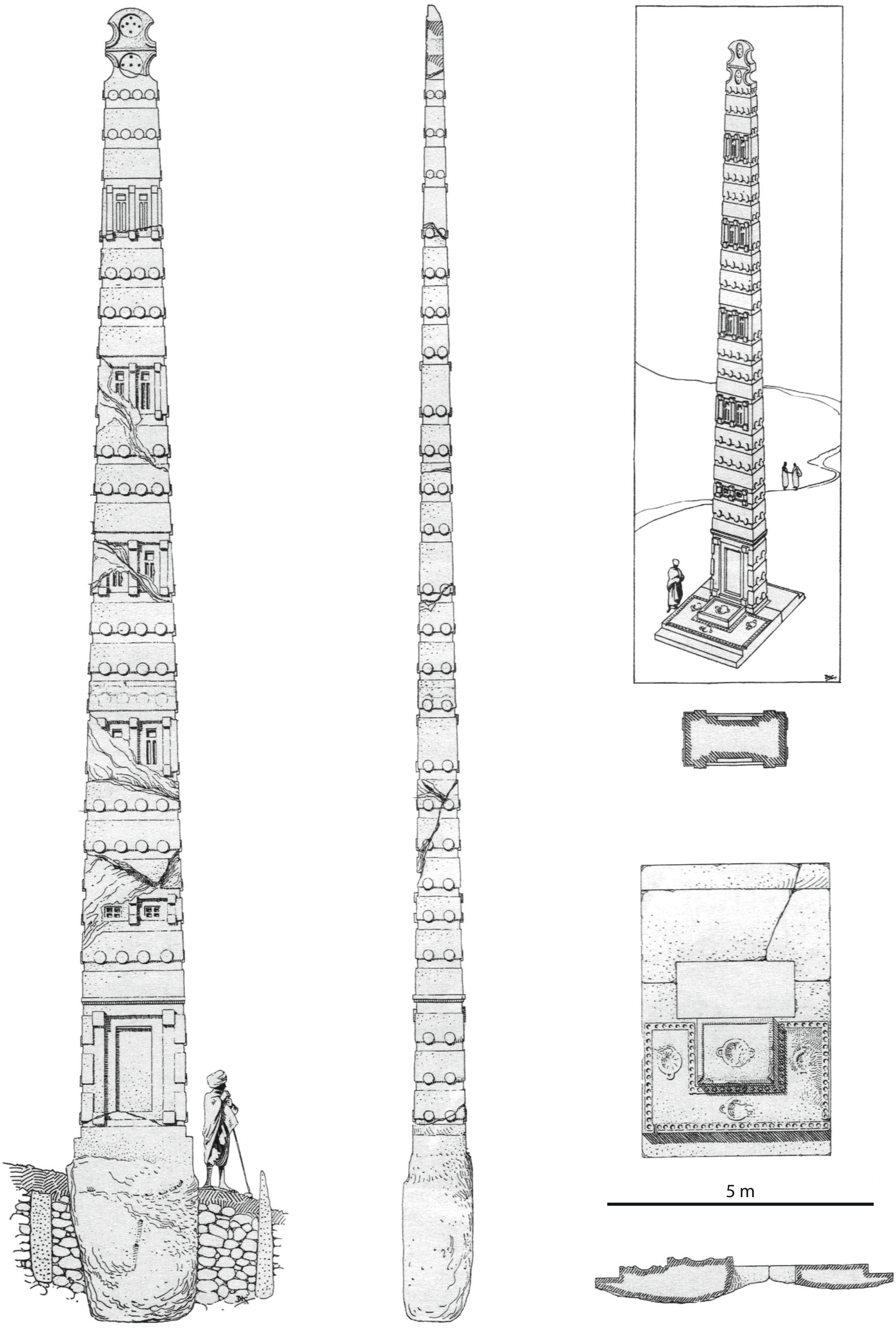

Figure 7 – Stela 4: 1906 drawing. Fallen and broken;
it was originally 18.20 m high and weighed 56 tonnes (after Littmann *et al.*, 1913).

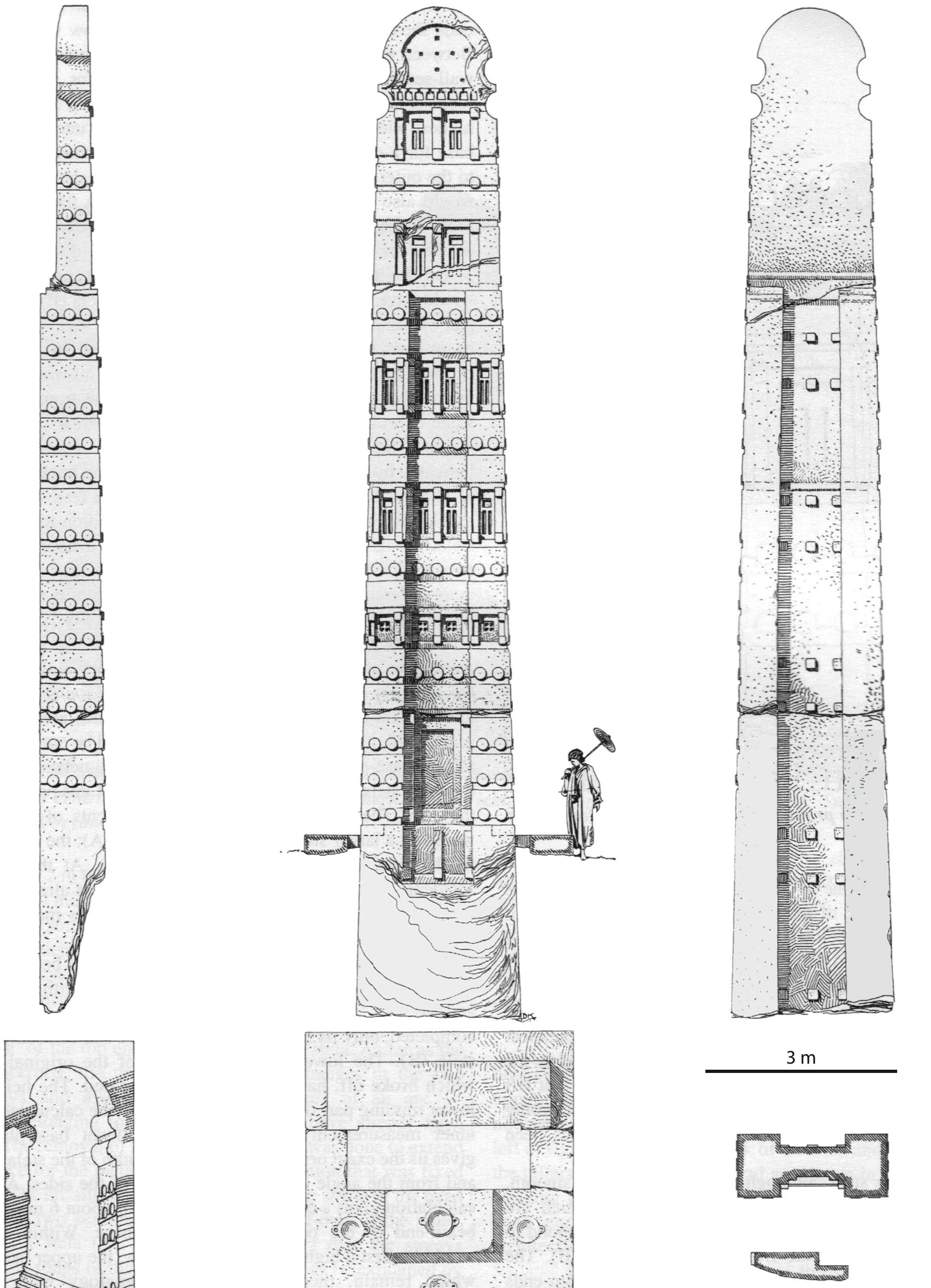

Figure 8 – Stela 5: 1906 drawing. Fallen and broken; it was originally 15.80 m high and weighed 75 tonnes (after Littmann *et al*., 1913).

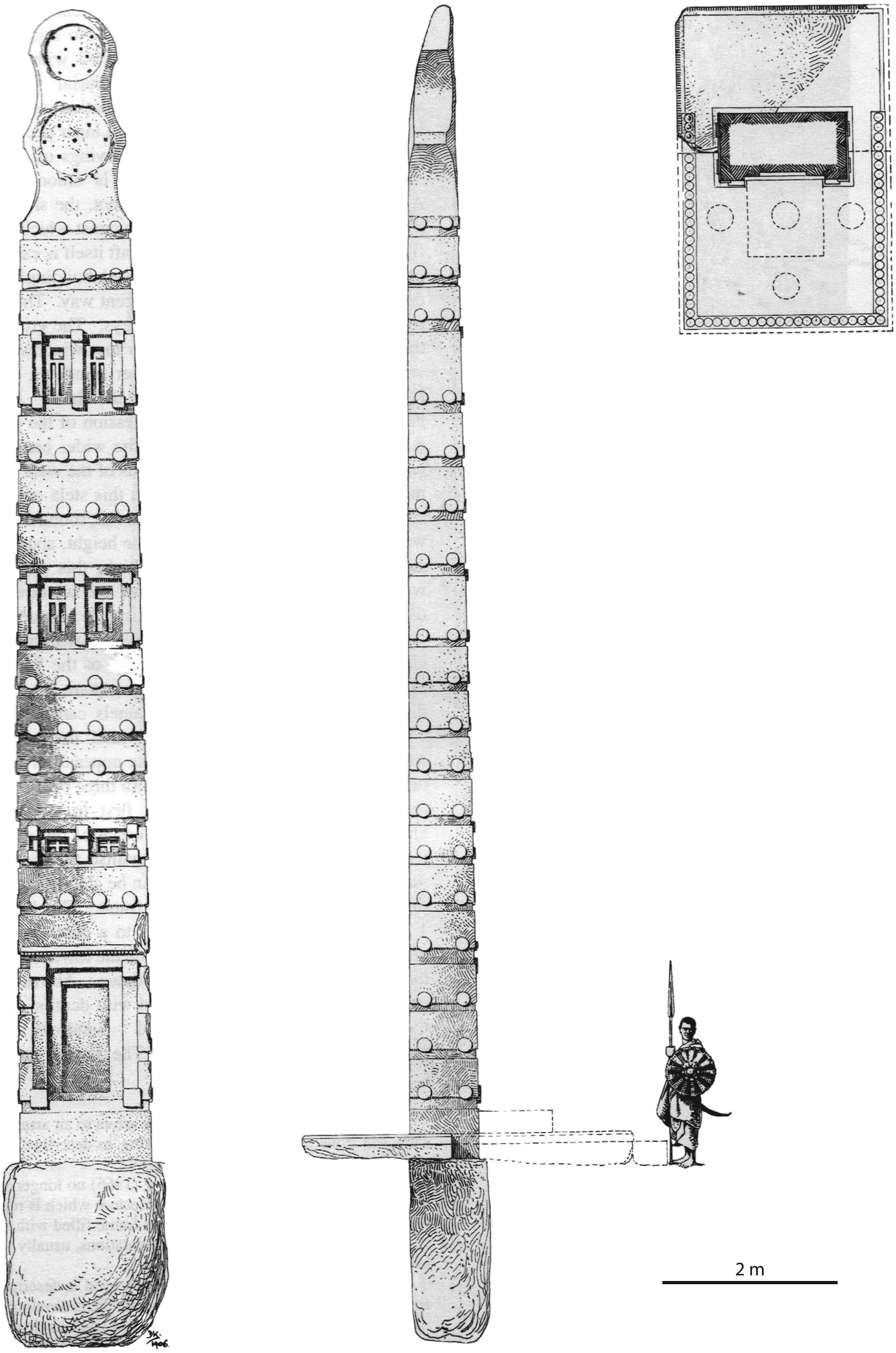

Figure 9 – Stela 6: 1906 drawing. Fallen and broken; it was originally 15.30 m high and weighed 43 tonnes (after Littmann *et al*., 1913).

Figure 10 – Stela 34: 1906 photograph. Since fallen; 5.70 m high (after Littmann *et al*., 1913).

The monoliths of Aksum have been subject to partial archaeological excavation during the 20th century. They were first examined, in 1906, by a German team led by Littmann (Littmann *et al*., 1913), which offered the first systematic lay-out of the site and numbered the stelae (we will use this numbering in this article). In 1937, during the Italian occupation, Stela 2, which was lying on the ground in five principal pieces, was removed on the orders of Mussolini and re-erected in Rome. Later, the Mission Française d'Archéologie en Éthiopie undertook excavations from 1954 to 1957 (de Contenson, 1959a, 1959b, 1963; Leclant, 1959). Finally, the British Institute in Eastern Africa took over, first under the leadership of Neville Chittick (from 1972 to 1974; Munro-Hay, 1989), then under David Phillipson (from 1993 to 1997; Phillipson, 2000).

In 1994, Phillipson carried out a series of test excavations at the place where Stela 2 had lain, and in 1997 he began to explore the location where it initially stood (Phillipson, 2000). From this work, he deduced that the stela had been raised on a ground level which was higher than the current ground level and which had been deliberately lowered at the end of the Aksumite period. We will see later what is to be made of these two assertions.

In January 1998, an Ethiopian team from the ARCCH[1] led by Yonas Beyene took up the research abandoned by the British. The team was assisted by an engineer, Tadele Bitul, who organised the removal of several enormous stones linked to the foundation of the stela and which were preventing the excavations from continuing. I became involved in October 1998 as advisor[2] to the ARCCH excavation, then led by Tekkle Hagos, in collaboration with the National Coordinating Committee for the Return of the Stela of Aksum. The excavation, which was very deep and took place in a narrow space encumbered by large blocks, could not then be completed.

1. The Ethiopian Authority for Research and Conservation of Cultural Heritage.
2. I was involved as a member of the Centre français des études éthiopiennes.

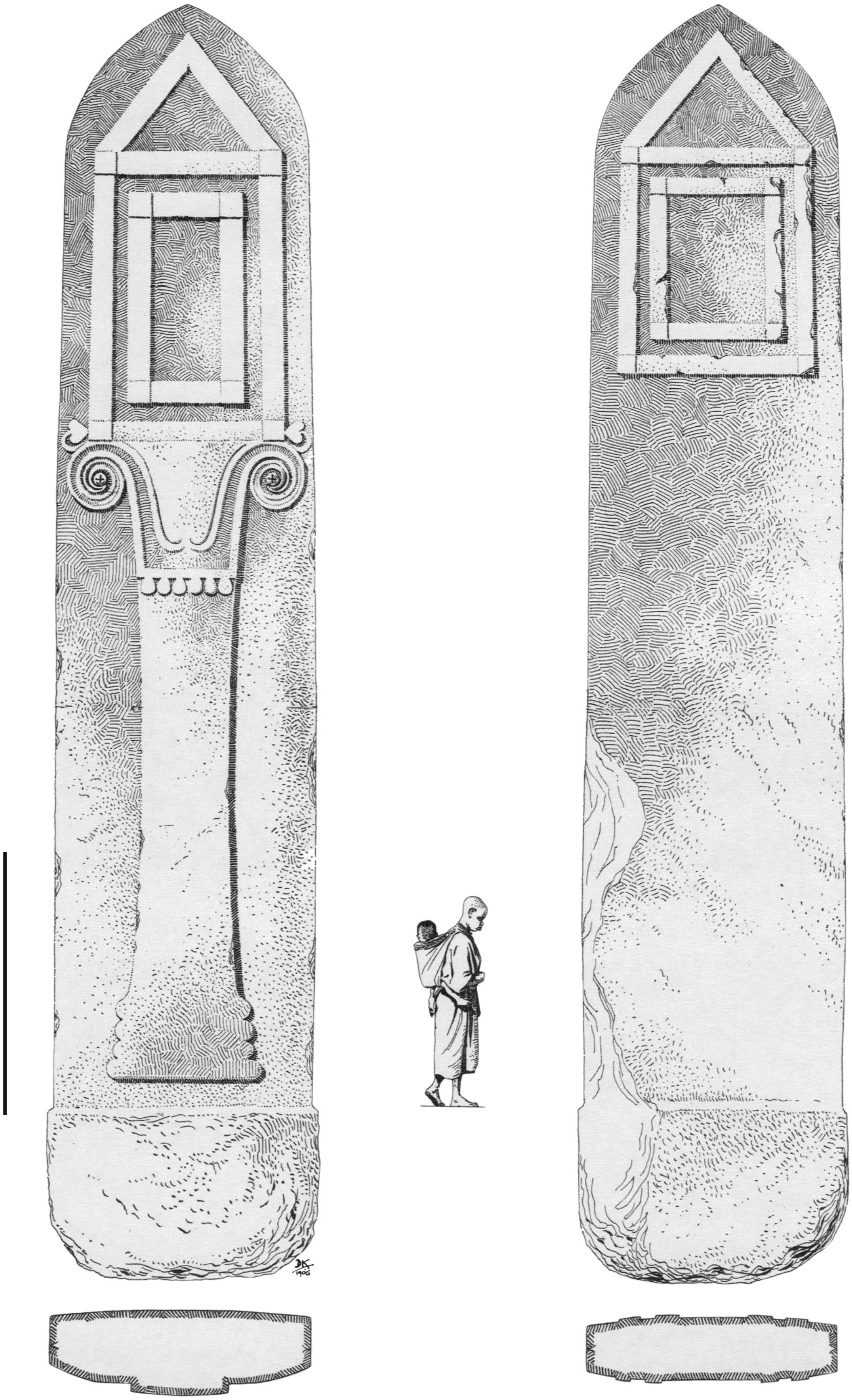

Figure 11 – Stela 7: 1906 drawing. Fallen (after Littmann *et al.*, 1913).

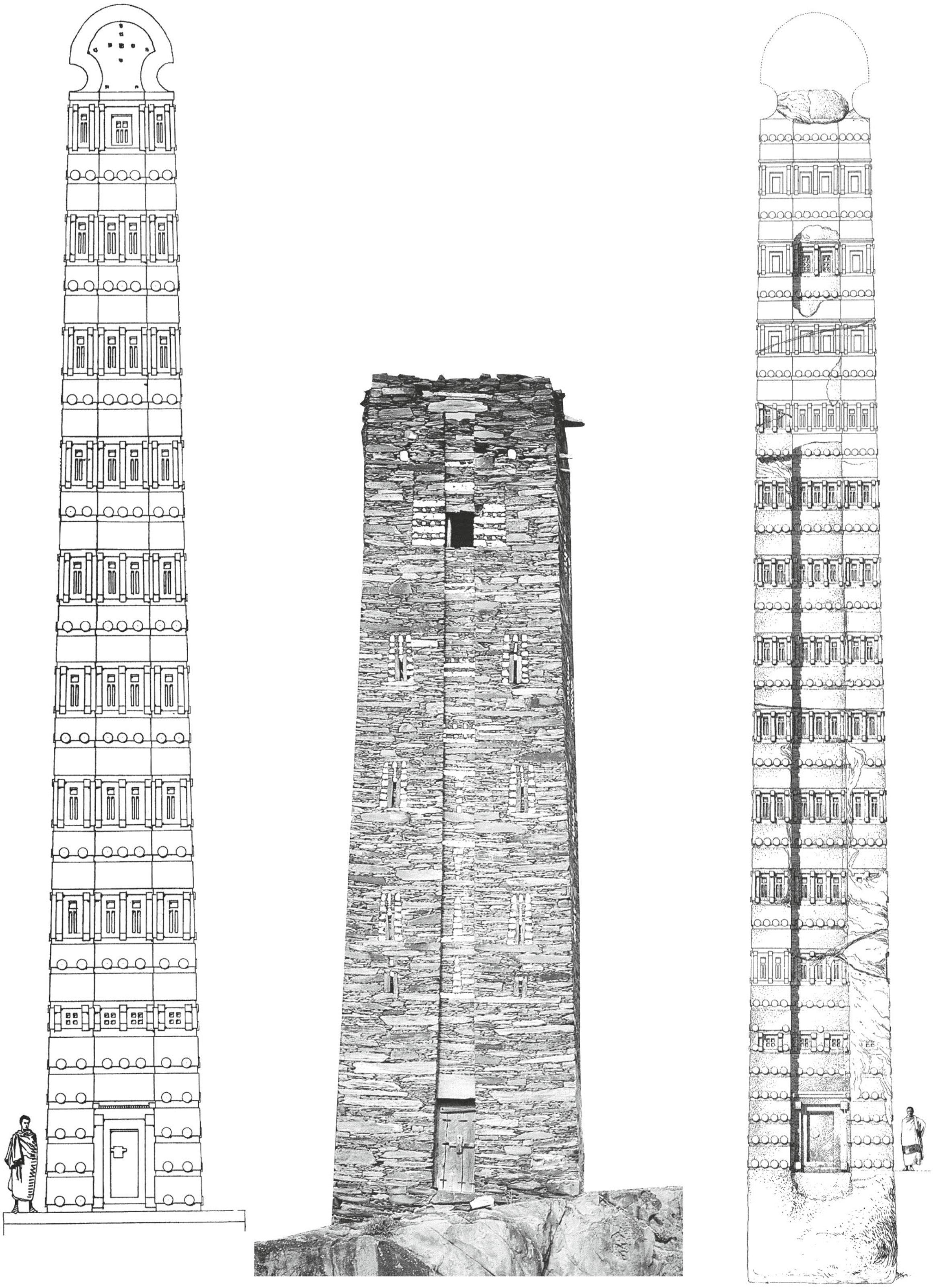

Figure 12 – Comparison (not to scale) between two stelae from Aksum (Stela 3 on the left, Stela 1 on the right, after Littmann *et al.*, 1913) and a defensive tower from southern Saudi Arabia (Asir highlands, photo reworked after Mauger, 2001: 64).

2 - The 1999 excavations

The following year, at the request of the Ethiopian government, I led a new team in an excavation of the presumed site of Stela 2, still with the aim of confirming its initial location, but also of documenting the context of its installation and collapse. The work was once again interrupted, this time by war[3].

The excavation was undertaken manually. The recent and/or disturbed levels were rapidly removed and the greatest of care was applied to the excavation of the sealed levels linked to the stela. At the end of the campaign, all sections both of our excavation and those preceding it were reinforced with stone walls. A test trench excavated by Phillipson in 1994 was cleaned out and filled with a stone construction in order to avoid any risk of collapse.

We enlarged the area of the previous excavation (Z1B) by 33 m^2 (Z1A) to the north. In addition, we opened a broad "window" onto the interior of the previous excavation, which enabled us to expose the bedrock on which the underground structure maintaining the stela had been installed.

2.1 - An enormous mass of underground masonry: foundation F9

The structure on which the stela stood was formed of a quadrangular masonry base (F9) at least 7.30 m long from northwest to southeast and 6 m wide, with a thickness of 4.50 m. We were able to clarify the boundaries of this base except in the southeast.

The opening of the "window" onto the interior of the previous excavation (figures 13-16) necessitated the removal of eight boulders with a total volume of around 3 m^3 (two of these stones had already been removed during the last excavation in October 1998). Solid bedrock (US 1025) appeared at a relative depth of 6.30 m. The Aksumites had followed its irregularities as it was revealed, and had flattened the upper part. The marks of their pick-type tools are still clearly visible (figure 16[14]). They then fixed very large blocks of rock on top of this using a whiteish mortar, thus constituting a kind of artificial rock several metres high.

The flat upper part of this massif of masonry was then topped by an enormous pecked and shaped slab, which played the role of the base; the excavations led by Phillipson found it in an upturned position (this is the "*footing slab*" in Phillipson's descriptions [2000]). Initially socketed into the construction, this slab had tipped towards the southeast when the stela fell, but still bore the exact location of the base of the stela in relief. This enabled us to determine accurately this location. The stones of the immediately underlying level presented fractures due to the pressure of the stela, which gave us accurate information about the height of this slab. However, locating the stela site in plan proved to be more difficult. To do this, we undertook a micro-topographical survey of the revealed surface of the foundation building. By comparing it with the position of the slab during the excavations and with the morphology of its base, we have been able to suggest a plan reconstruction for the slab with an estimated margin of error of less than ten centimetres (figure 17).

These observations provide us with information on the construction technique employed: wishing to rest their foundation on a solid substrate, the Aksumites had no qualms about excavating the softer upper levels of the rock (US 1018, 1017, 1021 and 1026) to a depth of 4.50 m, down to

3. The team was composed of: Bertrand Poissonnier (director, CFEE), Tekle Hagos (ARCCH), Zeresenay Alemseged (geological study, National Museum), Kalamoa Araya (†, pottery study, ARCCH), Jean-Marc Bryand (drawing), Asamerew Desse (ARCCH), Lionel Fadin (topography), Gigar Tesfaye (ARCCH) and around 20 local workers. The operation began on 17 January 1999 and was halted on 5 February due to the commencement of hostilities.

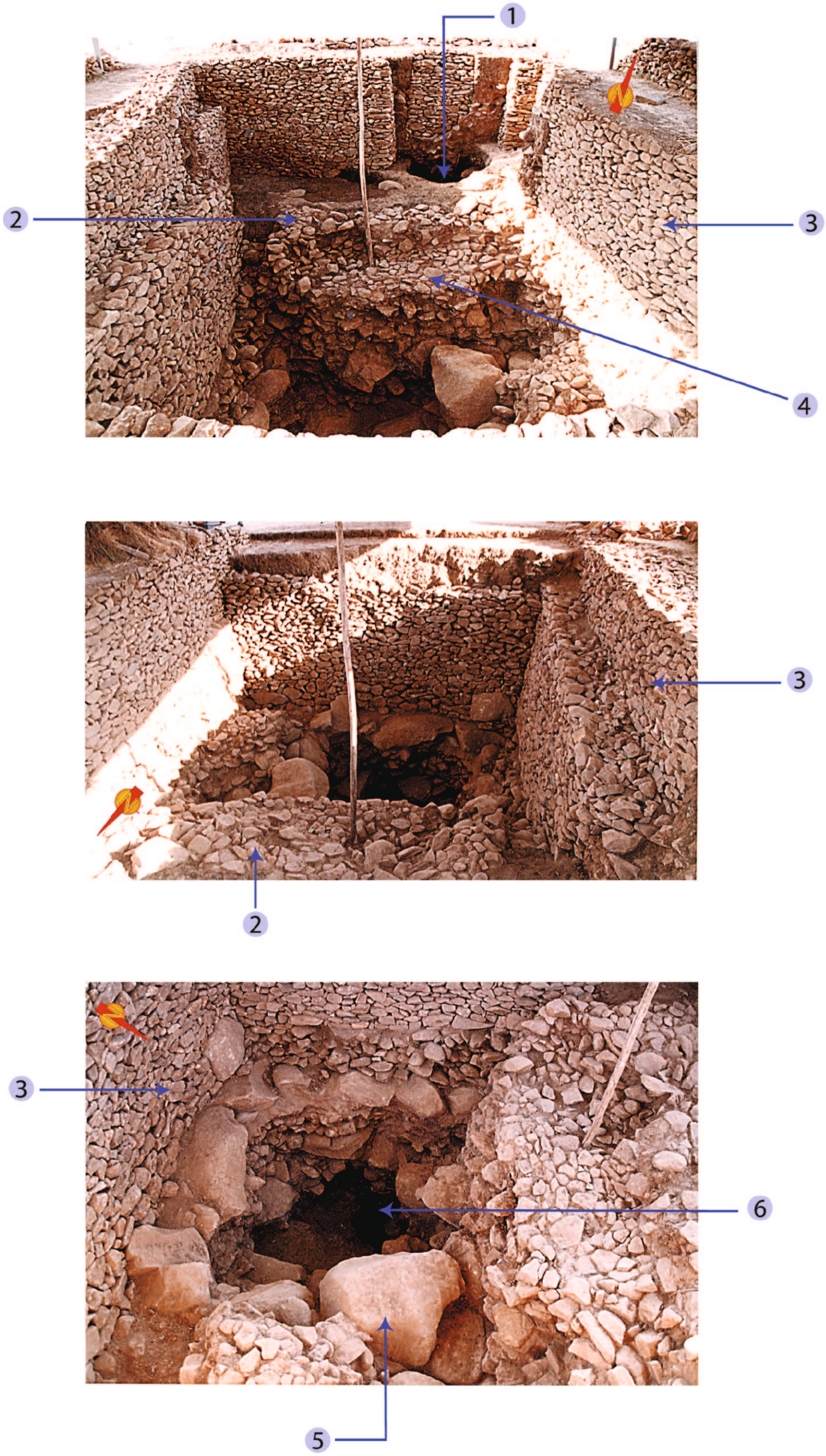

Figure 13 – Aksum, 1999: general view of the excavation at the foot of Stela 2. 1: Pit F10; 2: surface of the masonry of the foundation of Stela 2; 3: contemporary support wall; 4: location (in negative) of the "footing slab"; 5: rock; 6: window created through the foundation building to the resistant substrate (photograph: B. Poissonnier, CFEE).

a level with sufficient mechanical resistance (US 1025). They then arranged boulders, either raw or roughly hewn, binding them with mortar. The remainder of this carefully composed quadrangular construction is made up of smaller stones assembled with the same mortar. These smaller stones were also used for the facings of the foundation, as did the surface of the foundation that received the “footing slab” directly supporting the stela.

2.2 - An artificially constructed floor in mortar (US 1010-1011)

To the northwest of foundation F9 we uncovered a relatively uniform level of compact whiteish mortar (US1010-1011) of the same appearance as that used for the construction of the foundation (figure 15). This level had been perforated by trenches F2, F10 and F11 (figure 14). It rests directly on foundation F9. Elsewhere, it was supported on a level of black clay mixed with angular pebbles (US 1018). In the western sector, it forms a sort of concrete by the incorporation of angular pebbles and is perfectly analogous with the floors of contemporary Tigrayan houses. In the great section FG, this level presents a depression aligned northwest/southeast (figure 18).

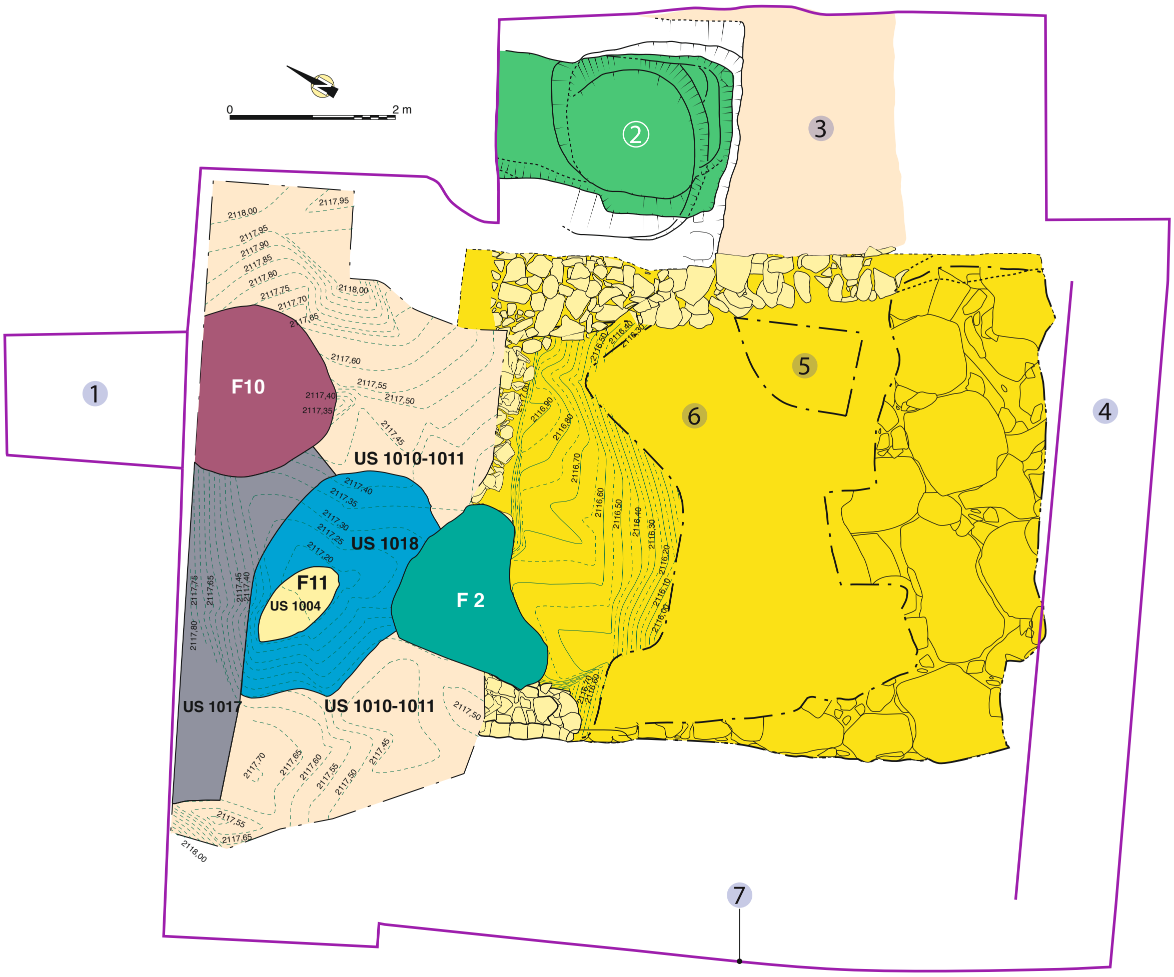

Figure 14 – Stratigraphic structures and units at the foot of Stela 2. 1: Trench from the 1994 excavations; 2: pit excavated in 1997; 3: Aksumite mortar floor; 4: deep step of 20 cm; 5: undisturbed sector; 6: disturbed sector; 7: boundary of the 1997 excavation (the a ltitudes are given in metres above sea-level; topography L. Fadin, CFEE; drawing and synthesis: B. Poissonnier, CFEE).

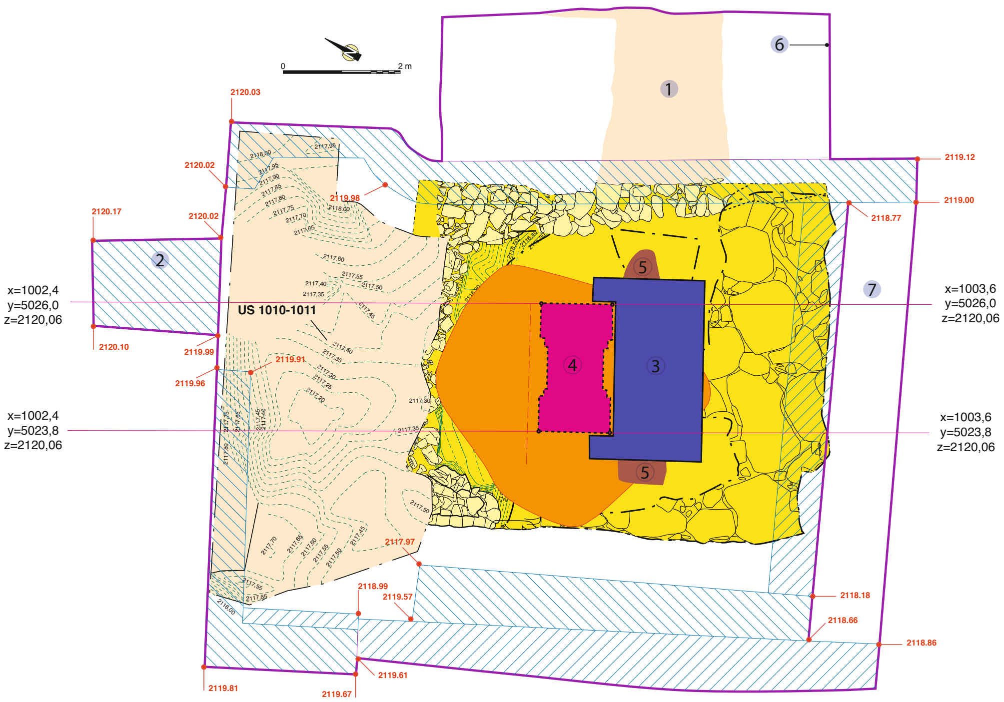

Figure 15 – Original location of Stela 2: plan of the 1999 excavation. 1: Aksumite mortar floor; 2: excavation trench; 3: base plate; 4: Stela 2; 5: wedge slab; 6: boundary of the 1997 excavation; 7: deep step of 20 cm (the altitudes are given in metres above sea-level; the coordinates of Stela 2 are local, at the level of the base plate; the point of origin, HPN1, was located close to the base of Stela 1; topography: L. Fadin, CFEE; drawing and synthesis: B. Poissonnier, CFEE).

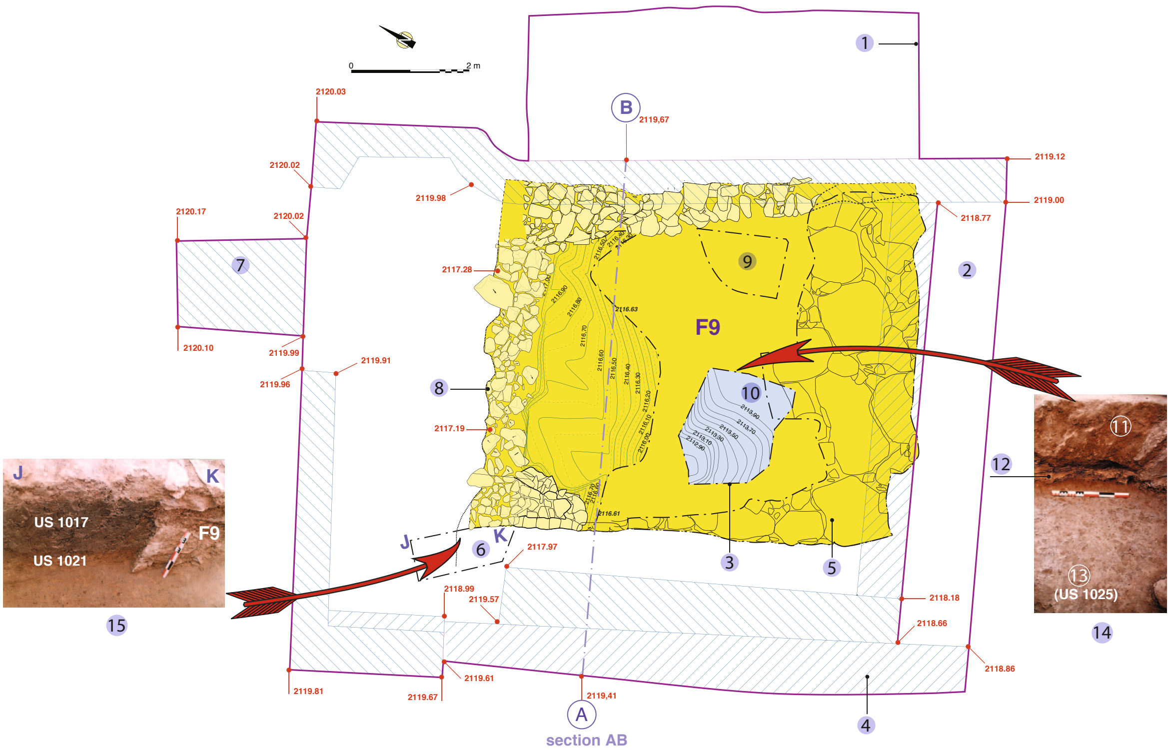

Figure 16 – Plan of the masonry building (F9) of the foundation of Stela 2: condition in 1999. 1: Boundary of the 1997 excavations; 2: deep step of 20 cm; 3: window showing the resistant substrate beneath the foundation; 4: contemporary support wall; 5: boulders integrated into the lower level of the foundation; 6: excavation trench; 7: 1994 excavation trench; 8: upper level of the foundation; 9: undisturbed portion; 10: resistant substrate; 11: boulder; 12: mortar; 13: resistant substrate; 14: boulder bonded with mortar to the flattened resistant substrate (scale = 50 cm); 15: section of the west angle of foundation F9 (scale = 50 cm; topography: L. Fadin, CFEE; drawing and synthesis: B. Poissonnier, CFEE).

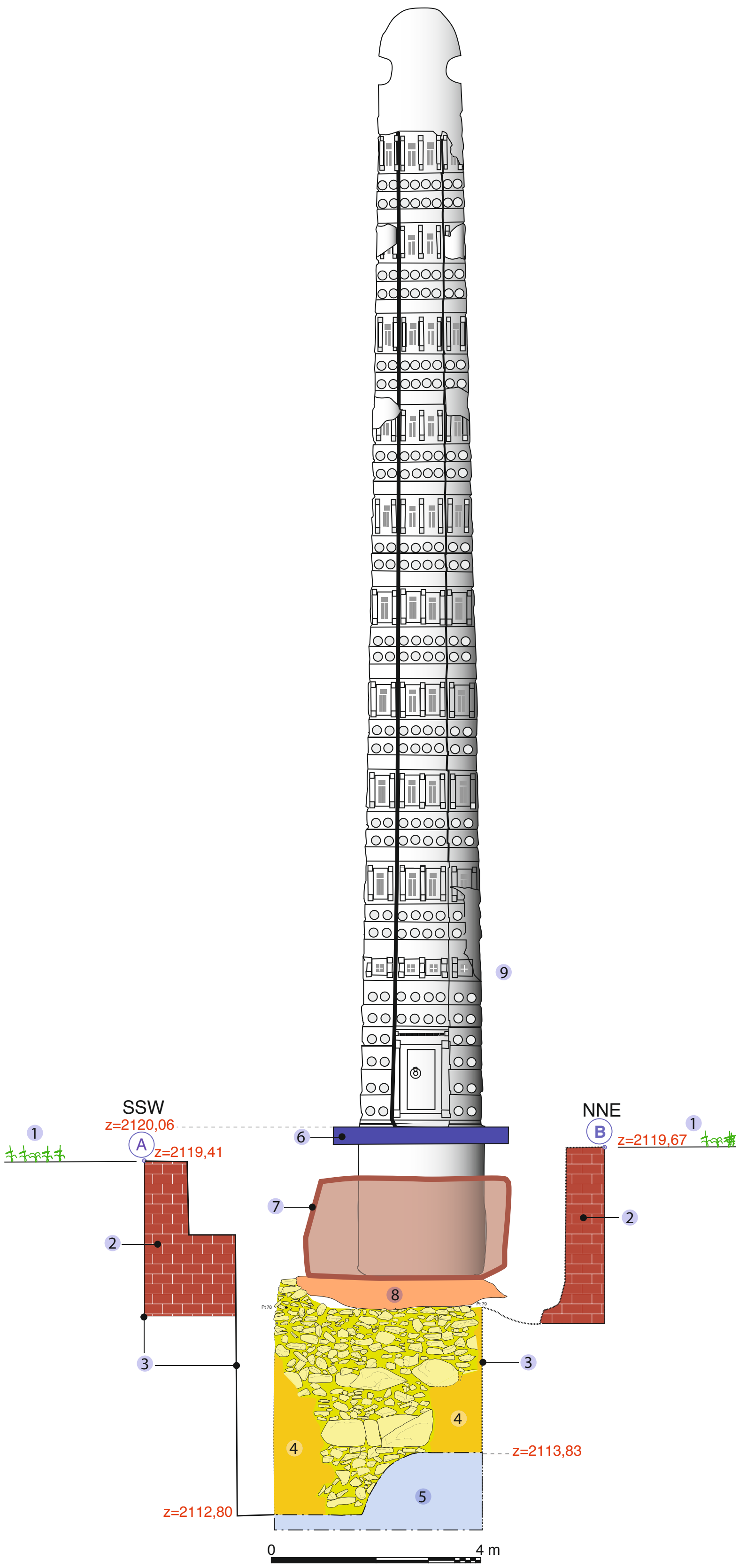

Figure 17 – Original location of Stela 2: section AB (SS0-NNE). 1: Current ground level; 2: contemporary support wall; 3: boundary of the excavation; 4: not detailed; 5: resistant substrate; 6: base plate; 7: wedge slab; 8: "footing slab"; 9: Stela 2 redrawn (after Littmann *et al.*, 1913; the altitudes are given in metres above sea-level; topography: L. Fadin, CFEE; drawing: J.-M. Bryand and B. Poissonnier, CFEE; synthesis: B. Poissonnier, CFEE).

Perhaps more or less flat originally, and intended to be resistant in order to permit the transport of the stela before its erection, this area had then settled under the heavy pressure from the passage of the stela. At the same time, it provides us with information on the contemporary circulation levels at the time of the construction: we finally have information that enables us to identify in terms of stratigraphy and height the ground levels linked to Stela 2.

We can also remark that the "Aksumite surface" excavated in 1997 to the northeast of foundation F9 was described by Phillipson and Watts (1998) as a "mortar" level which may correspond to US 1010-1011 (figure 15).

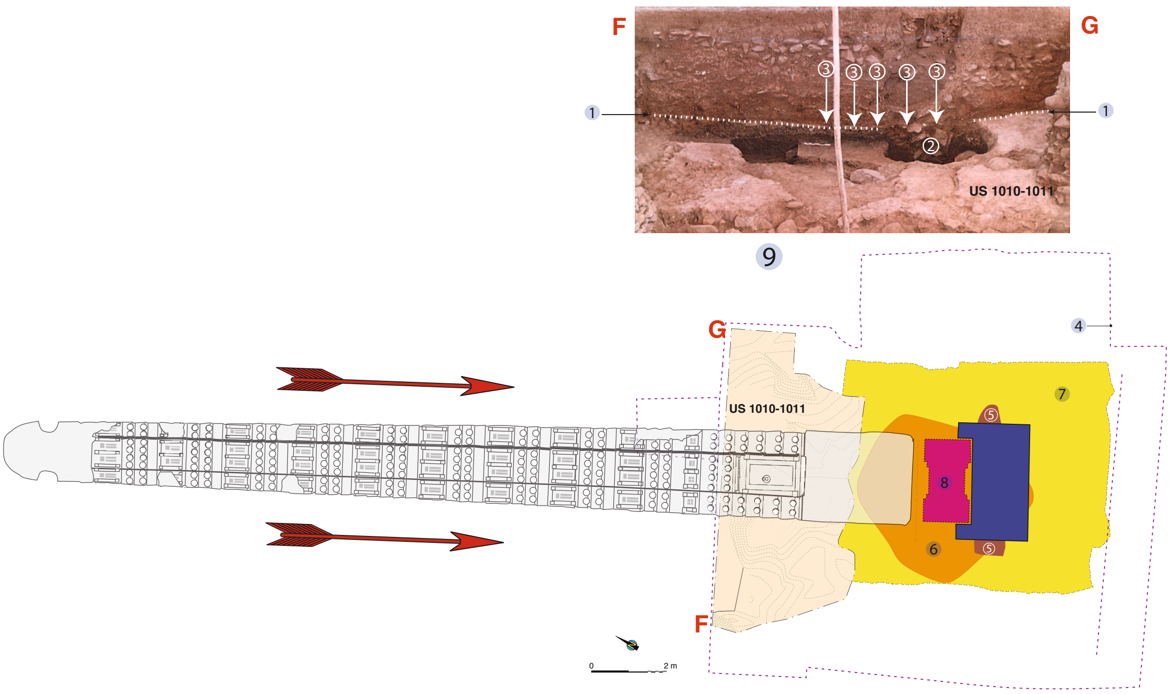

Figure 18 – Reconstruction of the direction of movement of Stela 2 just before its erection. 1: Upper limit of the mortar floor (US 1010-1011); 2: pit F10; 3: pressures; 4: boundary of the excavation: 5: wedge slab; 6: "footing slab"; 7: foundation masonry (F9); 8: section of Stela 2 in vertical position; 9: section FG showing the transverse depression in the axis of movement of the stela, probably due to the pressure linked to its movement (topography: L. Fadin, CFEE; drawing, photograph and synthesis: B. Poissonnier, CFEE).

2.3 - Pit trenches: graves?

To the northwest of foundation F9, we discovered two pits; at least one seems to be linked to the stela. This one (F10), with a depth of more than 7 m beneath the current surface, has an unusual profile (figure 19): a vertical shaft which becomes wider lower down and ends with a step opposite an offset recess.

The pit had been plundered long ago, but we were able to find remains of the probable original funerary deposit: a glass bead, fragments of several imported glass and pottery containers and a variety of metal objects (copper, bronze and, perhaps, lead). A flat quadrangular stone, roughly hewn, was also discovered in the deepest part of the pit. However, it is not possible to be certain whether this was part of the original deposit, as the fill of the whole structure after it had been plundered was itself comprised of many stones.

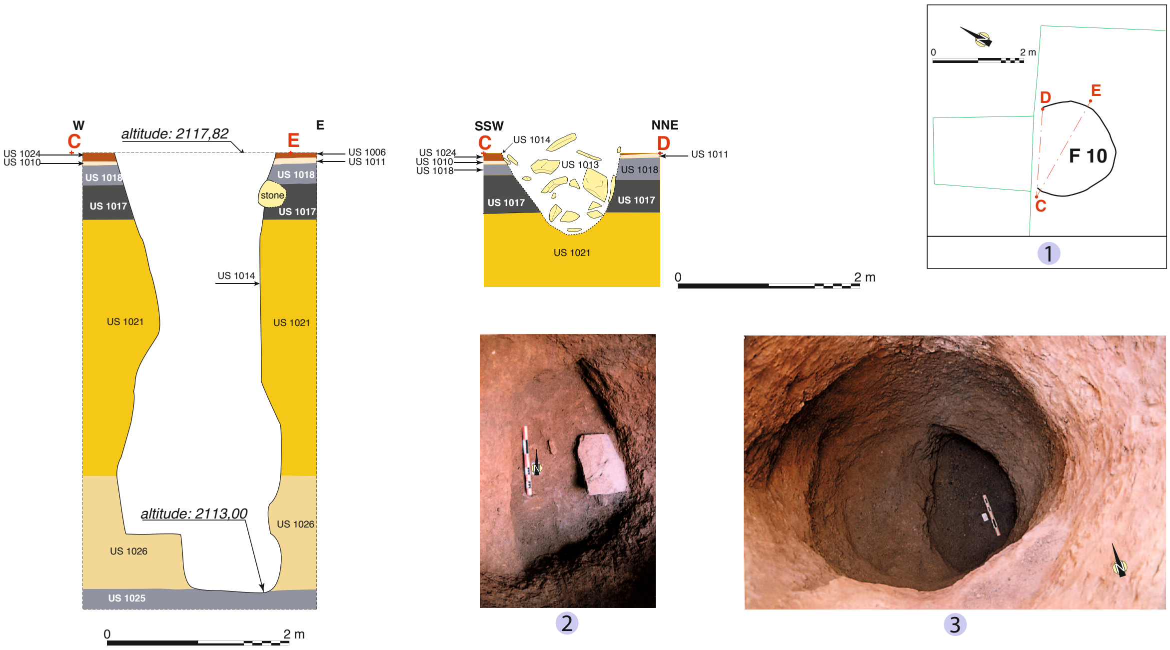

Figure 19 – Pit F10. 1: location of the sections; 2: slab at the bottom of pit F10 (scale = 50 cm); 3: pit F10 at the end of the excavation (scale = 50 cm) (The altitudes are given in metres above sea-level; topography: L. Fadin, CFEE; drawings, photographs and synthesis: B. Poissonnier, CFEE).

This pit had been dug, like the foundation of the stela, through the softer levels of the substrate (US 1018, 1017, 1021 and 1026[4]) to end in solid rock (US 1025). The original level of the opening of F10 is not known – the stratigraphical links were destroyed by the activities of the thieves – but it is logical to imagine that this pit was dug after the erection of Stela 2 since the mortar level (US 1010-1011) linked to the erection of the stela had been perforated by the shaft.

Another pit (F11), also clearly later than the erection of the stela, is located just to the north-west of the foundation (F9; figure 14). It can already be seen in an upper level (z = 2119.00 m) where it was marked by several large vertical stones. Its fill (US 1004), essentially formed of a very fine sediment, contained only a few stones and some rare sherds of Aksumite pottery (*Red Aksumite Ware*). More or less conical in form, this pit was at least 3 m deep (lower altitude: z = 2115.90 m). We do not know its function or date. The uniformity of its fill clearly distinguishes it from the neighbouring pit F10.

Finally, a disturbed area was noted in the west angle of foundation F9. This area (F2) probably corresponds to a pit dug after the fall of the stela and the tilting of its footing slab. It was observed in the excavation in 1997, during which it was recorded under number 1220.

A recent synthesis has demonstrated that pit graves are encountered from the north to the south of Ethiopia, from Antiquity to the present day (Fauvelle-Aymar, Poissonnier, 2012) and with a morphology similar to that of pit F10. Whatever the diameter and length, an access ("well") ends in a funerary space in which the body is deposited without being covered with sediment.

4. Studied by Zeresenay Alemseged (Poissonnier *et al.*, 1999).

It is, however, isolated in a variety of ways, for example with a stone slab. Once the body is underground, the access well is refilled. Stones are usually piled above the grave. It is thus tempting to read F10 as a pit grave the original contents of which have been disturbed. As for the possible bone remains, the local taphonomic conditions agree with the idea of disappearance by means of physicochemical weathering.

3 - When and how was Stela 2 erected?

During the excavation, we collected charcoal fragments unquestionably associated with the construction of the stela, as they came from the foundation itself and from the burnt level immediately underlying it, but unfortunately they could not be radiocarbon dated[5]. We also collected 2000 artefacts which have been recorded and deposited at the museum of Aksum. They will not be described in this article; we should, however, mention that the *Red Aksumite Ware* pottery associated with the foundation dates it to the 3rd or 4th century AD, in line with the data previously collected by the British team (Phillipson, 2000).

The mortar level seems to correspond to the working level on which the stela was transported to the site, which also indicates the direction from which it came, namely the north. We can thus suggest that the erection was carried out not by the tipping of the stela (from a higher level) into a supposed pit, but from the identified ground level, being supported directly by the monolithic footing slab. Nor has any trace of a ramp been discovered.

The large slab that wedged the obelisk to the southeast clearly broke during the fall of the latter. We have reconstructed it in its probable original position (figure 17). Its flattened, easily recognisable base must have been supported by the part of the footing slab carved in relief. The height of the wedge slab is not, however, sufficient to offer a suitable support for the base plate that surrounded the bottom of the decorated part of the obelisk; it was thus essential to wedge the stela with a construction above ground and reaching up to the upper level of the base plate (or an absolute altitude of 2120.06 m). This construction was probably adapted to the form of the foundation and should – although we cannot be categorical about this – have had a more or less parallelpipedic volume. If we admit that the probable pit graves (F10 and that of 1997) are associated with this stela, we must imagine a rather confined structure, and one which in any case did not impinge upon the pits (figure 20).

Only the megalithic elements of this “podium” have been reasonably well preserved over time. The remainder of the edifice was probably constituted of masonry with more modest stones, of which we have found no certain remains. It must have been possible to mount to the summit of the podium, because, like those preserved on the site, the base plates were equipped with small basins, probably intended for ceremonies. In addition, stelae 3, 4 and 5 demonstrate stepped plates which seem to be the edges of staircases.

This arrangement was perhaps that described by a traveller in 1520. Standing in front of Stela 3, he described the base, raised in relation to the surrounding ground, and which seems at that date to have retained part of its podium: “The stone which supports this one and serves as a base is as thick as a man is tall and well squared: seeming to be placed on others, small and large: but I do not know how deeply it penetrates them, or whether it reaches the ground” (Alvarez, 1558: 108).

5. Transferred for export authorisation to the ARCCH on our return to Addis Ababa, they were lost.

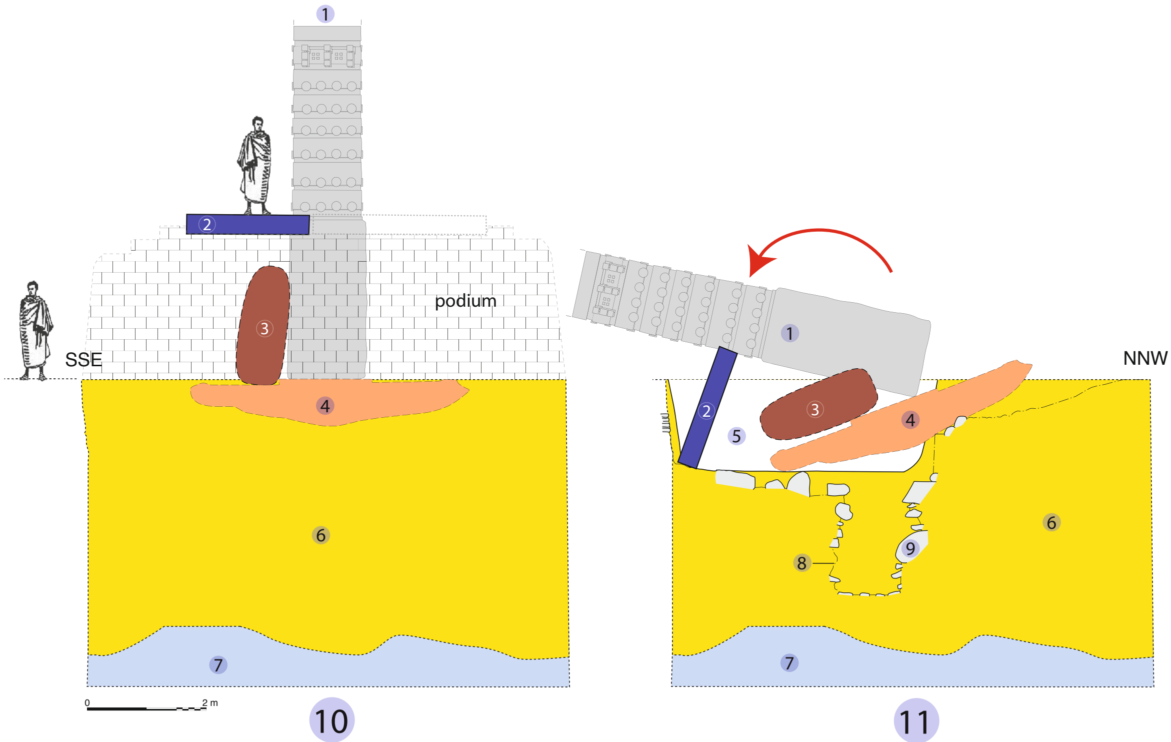

Figure 20 – Diagrammatic reconstruction of the process of collapse of Stela 2. 1: Stela 2; 2: base plate; 3: wedge slab; 4: "footing slab"; 5: plunder trench and disturbance; 6: masonry building of foundation (F9); 7: resistant rocky substrate (US 1025); boundary of the window of the excavation; 9: boulder integrated in the masonry of the foundation; 10: reconstruction of the original location of Stela 2; 11: scenario of the collapse of Stela 2 and synthesis of the elements discovered by successive archaeologists (drawing: J.-M. Bryand and B. Poissonnier, CFEE; synthesis: B. Poissonnier, CFEE).

3.1 - Absolute and relative altitude: three hypotheses

The proposal that we have just elaborated radically modifies the vision of Stela 2 and, in consequence, that of its neighbours, stelae 1 and 3, although we do not know the details of their foundations (figures 21-22). These stelae erected on podiums were higher, to the extent that Stela 1, 32.60 m long, would have been raised 32.60 m above the construction level when it was upright. This confers upon it the title of the highest monolith ever raised. However, stratigraphic information gathered from the 1999 excavations does not make it possible to differentiate with certainty between the construction levels and the circulation levels at the foot of Stela 2.

We will here attempt an overview of the three principal giant stelae. Three general hypotheses can be envisaged. The first, classic, hypothesis, is that of a circulation level corresponding to the base of the base plates; this assumes the refilling of the sector on an enormous scale (figure 22, niveau 1). In this case, the stepped portion of the base plates would not truly play the role of a staircase, at most representing the final steps of an extremely reduced podium. The stelae lose the visual benefit of the podiums, but is this the effect that was sought? Struck as we are today by the size of these exceptional monuments, we risk misjudging the intentions from which they result. We must not forget that the stelae field is above all a hypogean field, and that this funerary assemblage should not be equated to a simple display of upright stones.

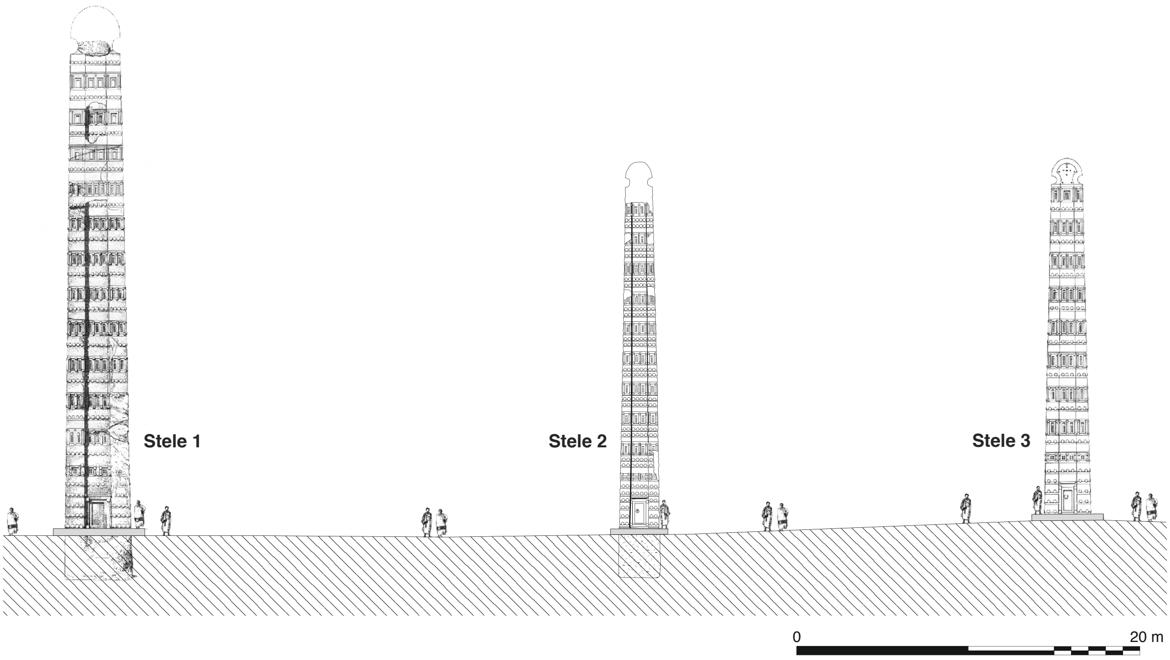

Figure 21 – Reconstruction of the alignment of stelae 1, 2 and 3 according to the "classic" view of the stelae field. The stelae drawn after E. Littman *et al.* (1913) have been located according to the topography and Stela 2 has been replaced according to our work. The underground structures at the base of Stela 1 have not been depicted.

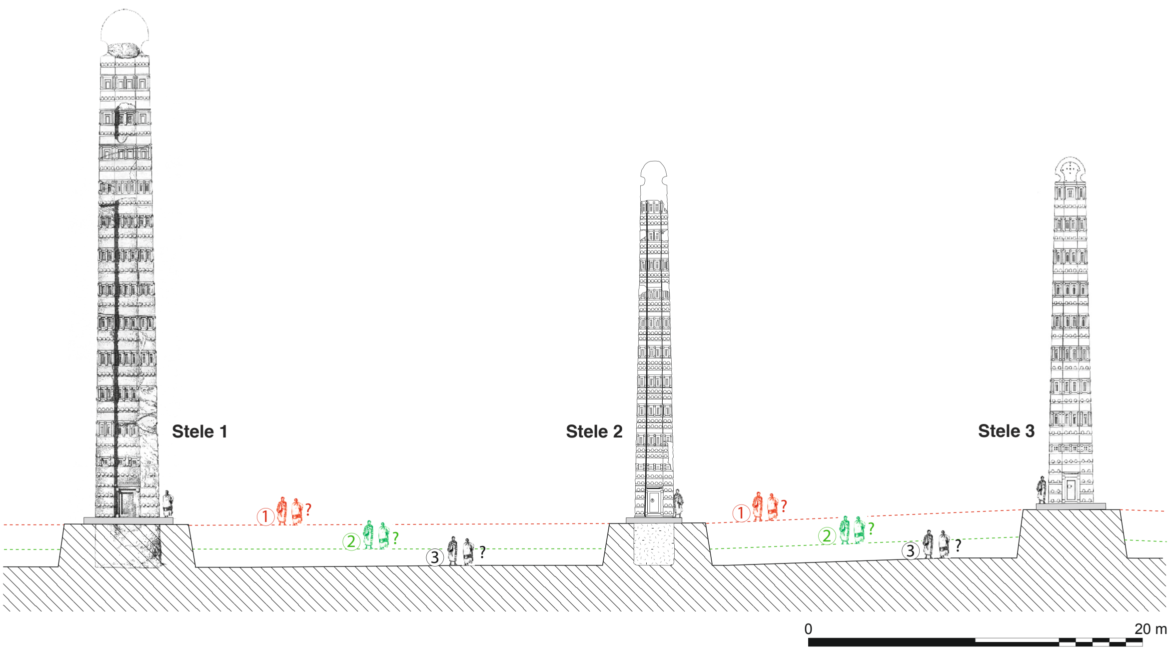

Figure 22 – Reconstruction of the alignment of stelae 1, 2 and 3 according to our proposal. The underground structures at the base of Stela 1 have not been depicted. 1: Hypothetical upper circulation level; 2: hypothetical intermediate circulation level; 3: hypothetical lower circulation level, namely the construction level.

In the second hypothesis, the construction levels correspond more or less to the circulation levels, at the base of the podiums, which optimises the relative height of the stelae, and thus their disproportion (figure 22, niveau 3). However, the proximity of the long terrace wall M1 (figure 23) poses a problem: how did it relate to the podiums? Even if we imagine that this wall, still 3 m high in places in 1955 (Leclant, 1959: 4), and which was reconstructed on its Aksumite bases during the 20th century, was a little lower than its current appearance, its higher altitude can be deduced from the current location of Stela 1, which broke when it fell on top of the wall: it must have been higher than the base of the podiums (figure 24). Would it be correct to say that, as seems to us most probable, the circulation level was situated on an intermediate level, around one metre above the construction level (figure 22, niveau 2)?

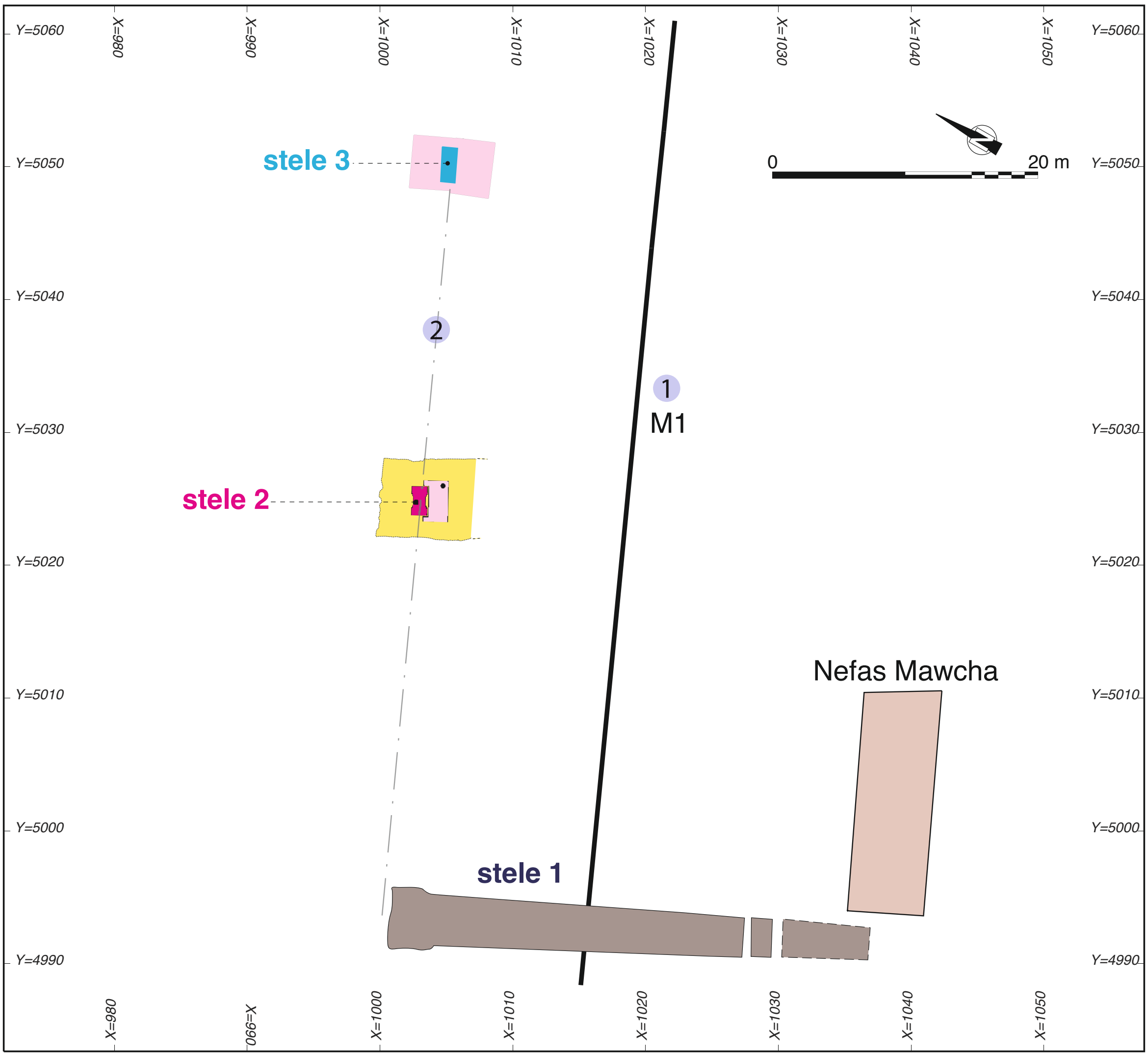

Figure 23 – View of the alignment of stelae 1, 2 and 3, parallel to Aksumite wall M1. 1: Wall M1; 2: virtual parallel to wall M1 (topography: L. Fadin, CFEE; drawing and synthesis: B. Poissonnier, CFEE).

Figure 24 – Stela 1 facing north (photograph: B. Poissonnier, 1996).

3.2 - Raising a giant monolith

Can we now attempt to reconstruct the manner in which the stela was erected? Firstly, the extraction site 4 km away of the great stelae has been identified, and transportation routes have been proposed (Phillipson, 2000: 229-251). We do not know the methods by which they were transported, but we must recall the local presence of very large trees, giant junipers (*Juniperus procera*), which could have offered excellent rollers and other timber. Contrary to the classic hypotheses (Phillipson, 2000: 251-254), we thus suggest that the stela was not tipped into a pit, and that the use of a ramp – a method more valued by archaeologists than by early constructors – was here very unlikely. It is true that we have no direct evidence for the operation. We do, however, possess extraordinarily valuable evidence relating to comparable work carried out in the Roman world, at about the same time.

In around 330 AD, two obelisks from Karnak were transported to Alexandria; one was then moved to Rome, the other to Constantinople. Excavations at the initial site of the latter have revealed the substructure of raw earth bricks for the large-scale wooden scaffolding that enabled it to be dismantled without being damaged (Azim, 1980; Azim, Golvin, 1982). There was an eye-witness to the re-erection in the Circus Maximus at Rome, in 357 AD, of the great obelisk of Karnak, 32.18 m long (perhaps originally 32.50 m) and weighing 460 to 510 tonnes according to estimates. Ammianus Marcellinus explains how, three miles from there, disembarking from the Tiber, "it was put on rollers and carefully drawn [...] and brought into the Circus Maximus. After this there remained only the raising, which it was thought could be accomplished only with great difficulty, perhaps not at all. But it was done in the following manner: to tall beams which were brought and raised on end (so that you would see a very grove of derricks) were fastened long and heavy ropes in the likeness of a manifold web hiding the sky with their excessive numbers. To these was attached that veritable mountain [the monolith] [...] and it was gradually drawn up on high through the empty air, and after hanging for a long time, while many thousand men turned wheels resembling millstones, it was finally placed in the middle of the circus" (Ammianus

Marcellinus, 1989, 17, IV, 15). It is clear that the operation was slow: it took place "gradually", the monolith "hanging for a long time". The tension of the ropes must have had to be perfectly controlled, and any jerking avoided.

Another exceptional document from the 4th century concerns the re-erection at Constantinople in 390 AD of the obelisk of Thutmose III, with an estimated length of 29.0 m and a weight of 380 tonnes. The base of the monument bore Roman bas-reliefs (figures 25-27) together with two inscriptions providing information on the duration of the erection operation: three times ten days according to the Latin text, thirty-two according to the Greek text (Iversen, 1972: 12-13). This duration alone reveals the precautions that surrounded the manipulation of a monument of such inertia, losing control of which would have had irreparable consequences. It is also interesting to note that in this case the obelisk was not tipped into a pit: one of the bas-reliefs on the base, which illustrates the operation, shows it installed on a pedestal.

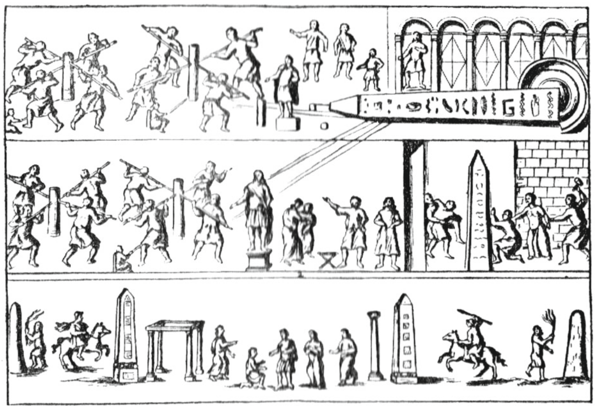

Figure 25 – Roman bas-reliefs at the base of the obelisk of Karnak, re-erected at Constantinople in 390, drawn in 1675 (after Spon and Wheeler, 1678).

Figure 26 – Roman bas-reliefs at the base of the obelisk of Karnak, re-erected at Constantinople in 390. Elements remaining today, left part (photograph: P. Moret, Traces, UMR 5608).

Figure 27 – Roman bas-reliefs at the base of the obelisk of Karnak, re-erected at Constantinople in 390. Elements remaining today, right part (photograph: P. Moret, Traces, UMR 5608).

These accounts from the 4th century – in other words contemporary with the erection of the great stelae at Aksum – should be taken into account when attempting to understand the technical context of the Ethiopian achievements. Nor is Egypt very distant from Aksum. The elements in our possession permit us to assume the use of wooden rollers (attested in Rome) for the transport of monoliths, and the manufacture of enormous wooden structures and a great quantity of ropes enabling the power applied to be multiplied through pulley systems, winches and other capstans. It is worth noting that, in the pre-industrial world, sailors were the specialists in moving and lifting the heaviest loads, from water-borne transport to problems of loading and unloading. Until the 19th century, in the majority of cases naval architects were in charge of the operations to transport and re-erect ancient obelisks in several capitals far distant from Egypt. And the Aksumite culture was a maritime culture, open to the Red Sea. Even if the erection of stelae was a phenomenon known in Ethiopia in the Pre-Aksumite period, perhaps rooted in even older practices (Fattovitch, 1987), the implementation of the series of giant stelae at Aksum could only have been carried out by calling upon exceptional methods borrowed from new technical repertoires. Indeed, this was the case more than a millennium later, not in Africa but in Italy, as we will soon see.

The ancient obelisks present in Rome aroused great interest among the Renaissance popes. Under the pontificate of Nicholas V (1447-1455) it was thus planned to move an obelisk, which had been transported in 37 AD from Alexandria to the circus of Caligula, in order to re-erect it in front of the cathedral. Judged to be impossible, this project was abandoned; however, it was frequently revived during the following century (Hemphill, 1990). Pope Sixtus V in turn launched a competition with the intention of selecting the best plan for the project. The technical difficulties seemed to be insurmountable, despite a great number of applications from excellent engineers, until architect Domenico Fontana was awarded the project in 1586. He constructed a double tower in wood, dismantled (figures 28-29) the 25.13 m high obelisk, which weighed around 340 tonnes, then moved it 260 m from the side of St. Peter's Basilica in Rome, where it was partly buried in ruins, to the Piazza del Popolo, where he re-erected it (figures 30-32) on a pedestal. To carry out the operation, 40 special capstans were worked by 800 men and 75 horses, while 106 men manipulated five gigantic levers. The complete operation took a long time, but the erection itself only took 13 hours, to the great amazement of those present; the wedges between the pedestal and the block were then removed, and the monolith installed in its final position (Fontana, 1590; Wallis Budge, 1926: 41-47). Two years later, the same architect moved the obelisk described by Ammianus Marcellinus and re-erected it on the Piazza di San Giovanni in Laterano.

These operations employed traditional knowledge very similar to the technical context of the Antique period. One thing is certain: these techniques could not be envisaged in narrow or cluttered spaces, as is shown by figures 31 and 32, in which the capstans, men and horses cover the piazza; indeed, in reality they would have done so to a much greater extent than is suggested by the artist. In the case of Aksum, the rare stelae set up behind the giant stelae could not reasonably antedate the erection of their larger sisters, for technical reasons. In the same manner, given the excesses of the methods employed, it is considerably more restrictive to imagine a construction spread out over time, with a first assemblage linked to a single stela, then a second linked to a second, and a third to a third, which moreover is linked to a single long terrace wall, than a global construction project. We will return to this important point.

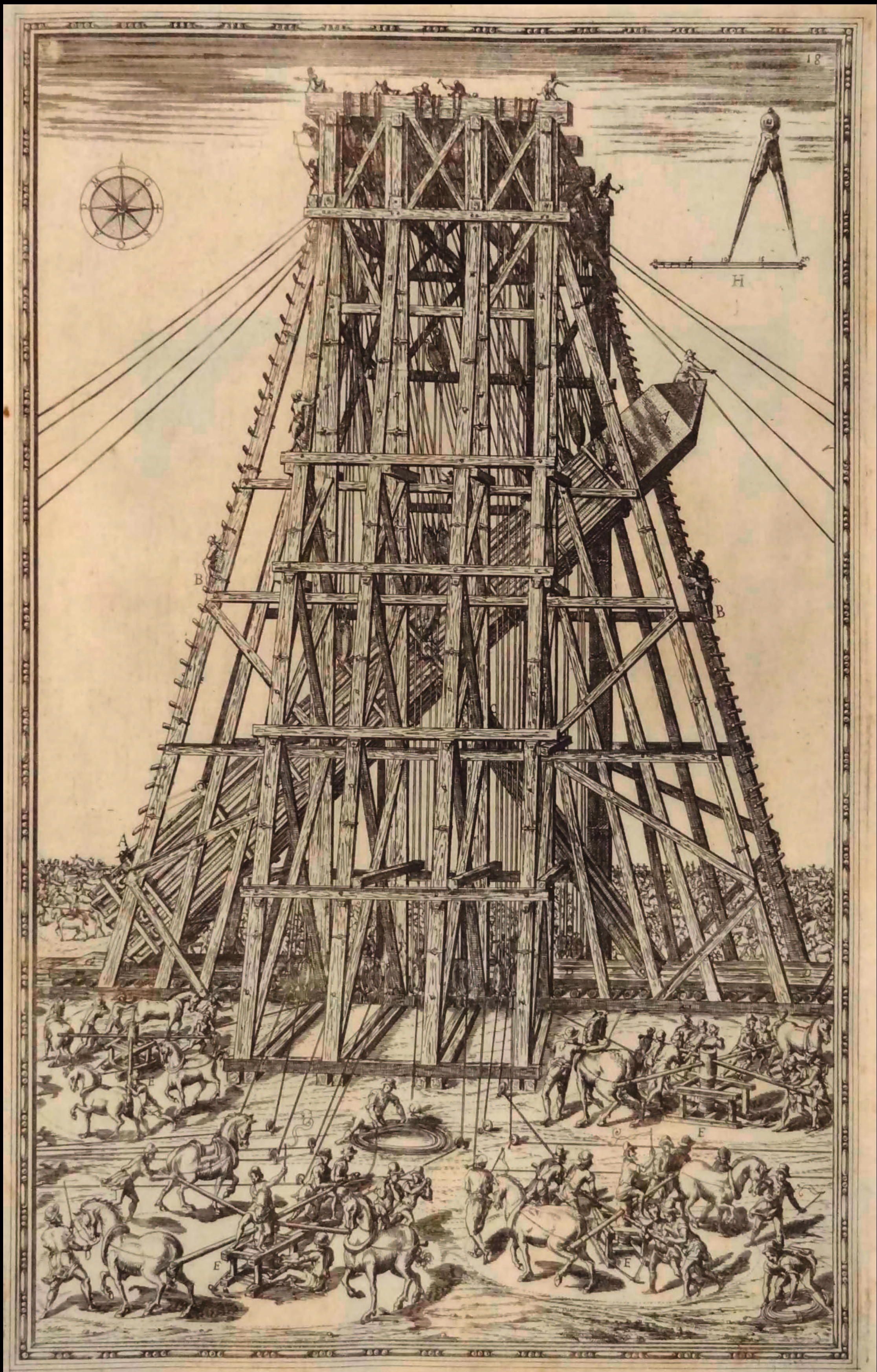

Figure 28 – During the dismantling of the Vatican obelisk, 1586 (in Fontana, 1590).

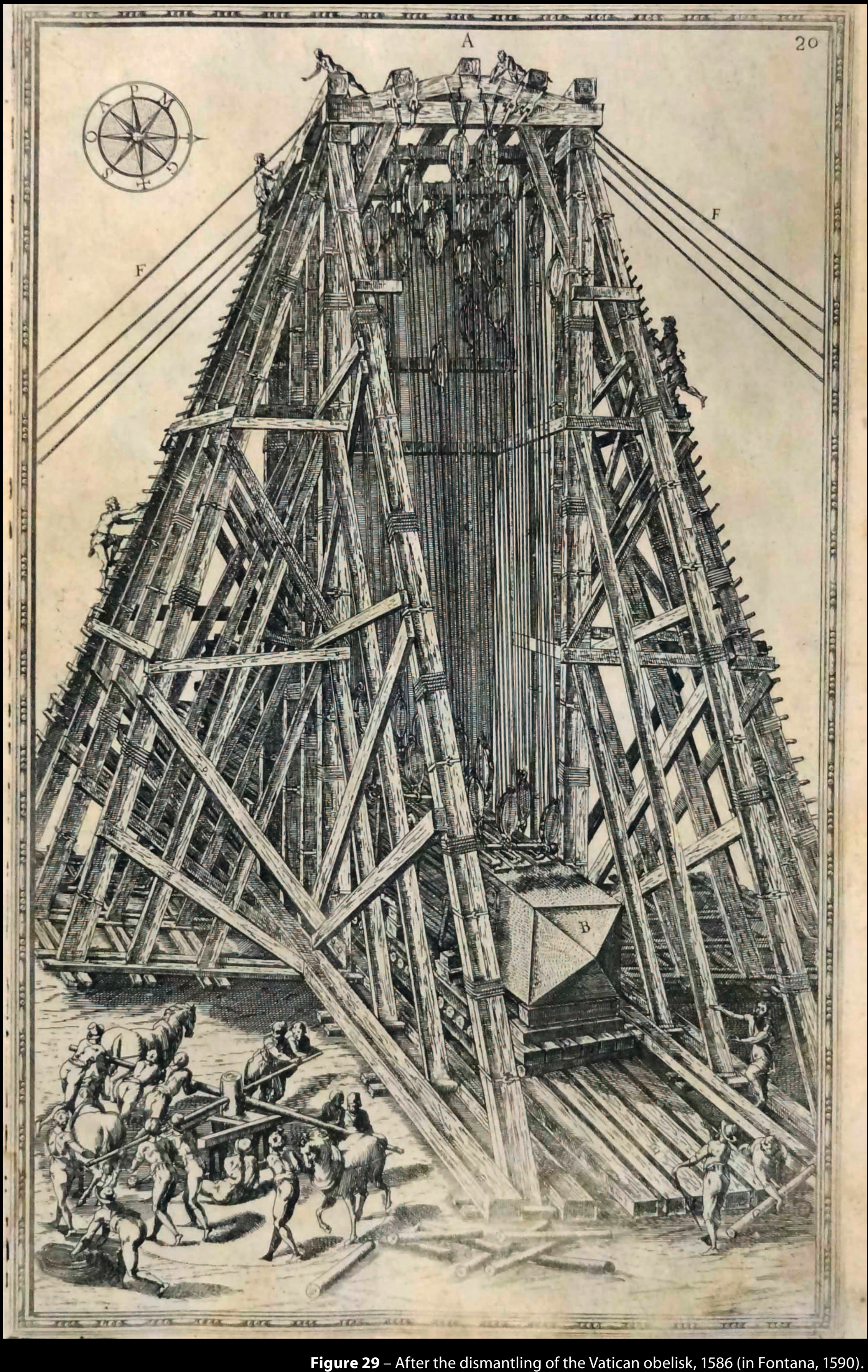

Figure 29 – After the dismantling of the Vatican obelisk, 1586 (in Fontana, 1590).

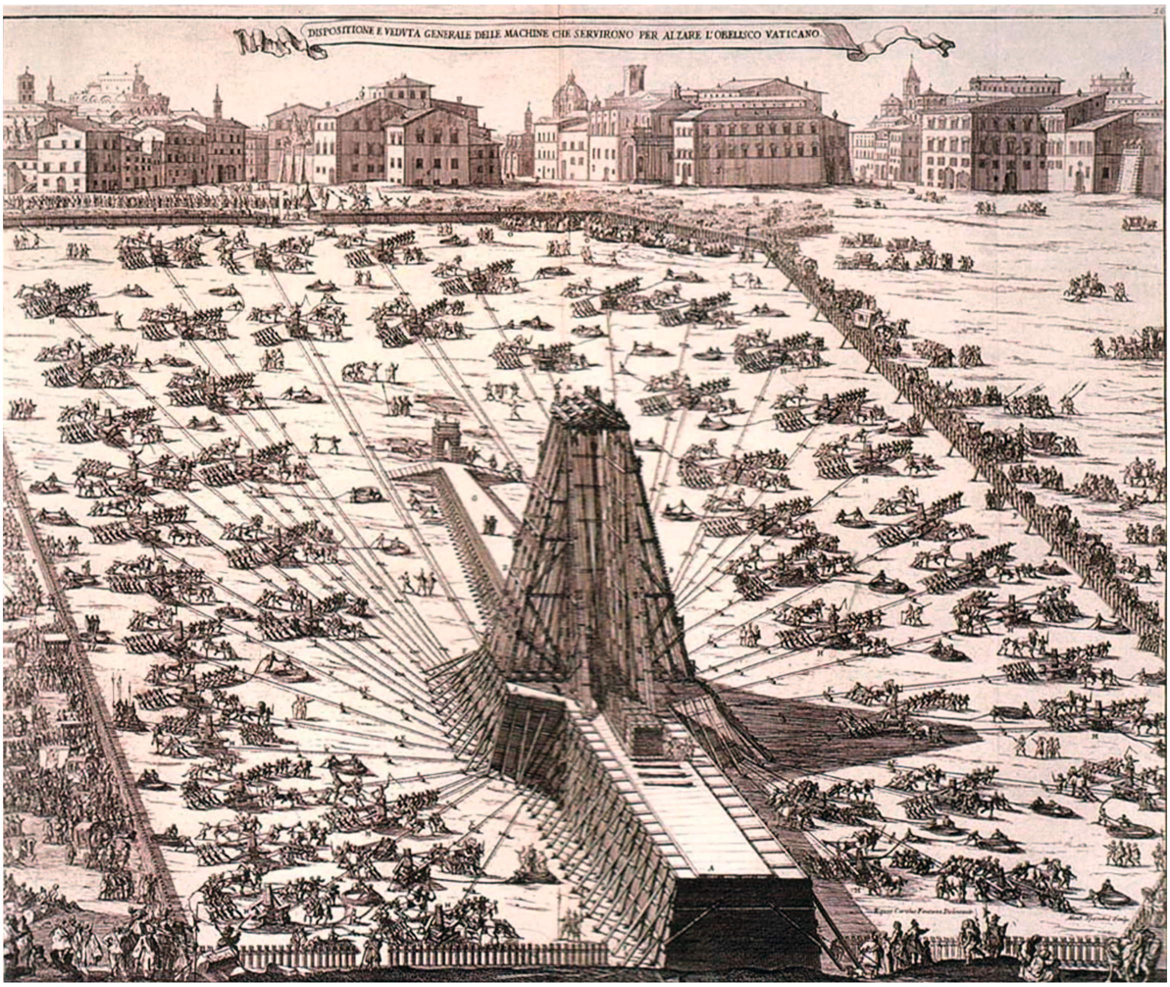

Figure 30 – Re-erection of the Vatican obelisk, 1586 (in Fontana, 1590).

4 - The collapse of Stela 2: when, how and why?

The 1997 excavations clearly demonstrated that during its collapse, Stela 2 tilted with its pedestal and its large wedge stone into a pit dug at its foot (Phillipson, 2000). The following research had confirmed this point (figure 20). We know today that it was a trench dug beneath the structure by thieves in search of precious objects that destabilised the pedestal, which slid to the south, while the stela tipped over, trapping the base plate beneath it. A coin of the Aksumite ruler Gersem, issued in around 600 AD and which circulated into the early 7th century, was discovered in 1998 on foundation F9, at the edge of the disturbances attributed to the thieves. This may indicate the approximate date of the fall of the stela, during a troubled period in the life of Aksum, which was undoubtedly not a leading settlement at the time.

The fall of the stela does not constitute a deliberate action: on the contrary, we can state that it was the accidental consequence of the sap made at the base by the thieves. Indeed, in 1906, the stela was still set in the base plate with which it had collapsed. There is no doubt that this stone would have been removed first if the monolith was to be deliberately toppled.

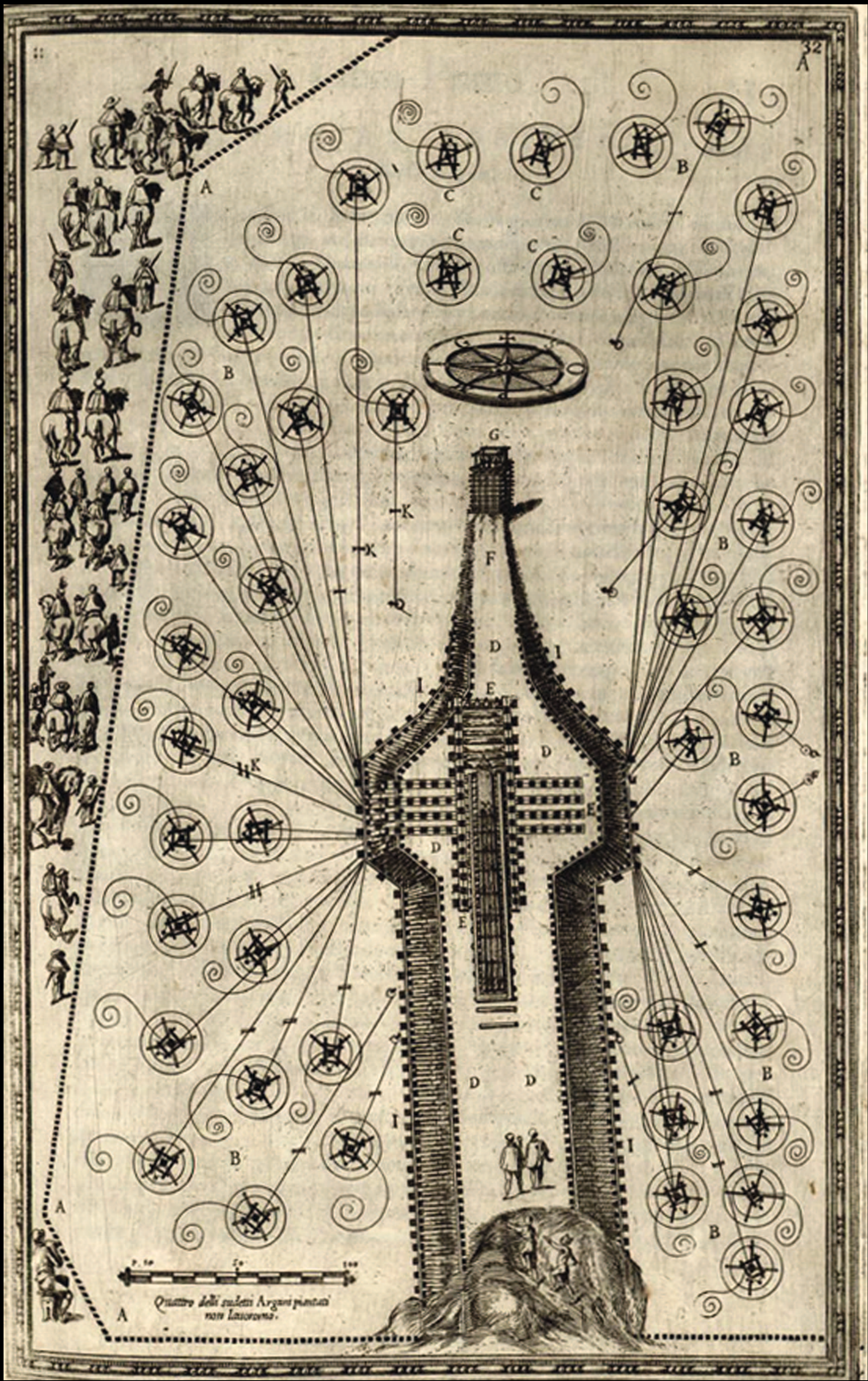

Figure 31 – Re-erection of the Vatican obelisk, 1586 (in Fontana, 1590).

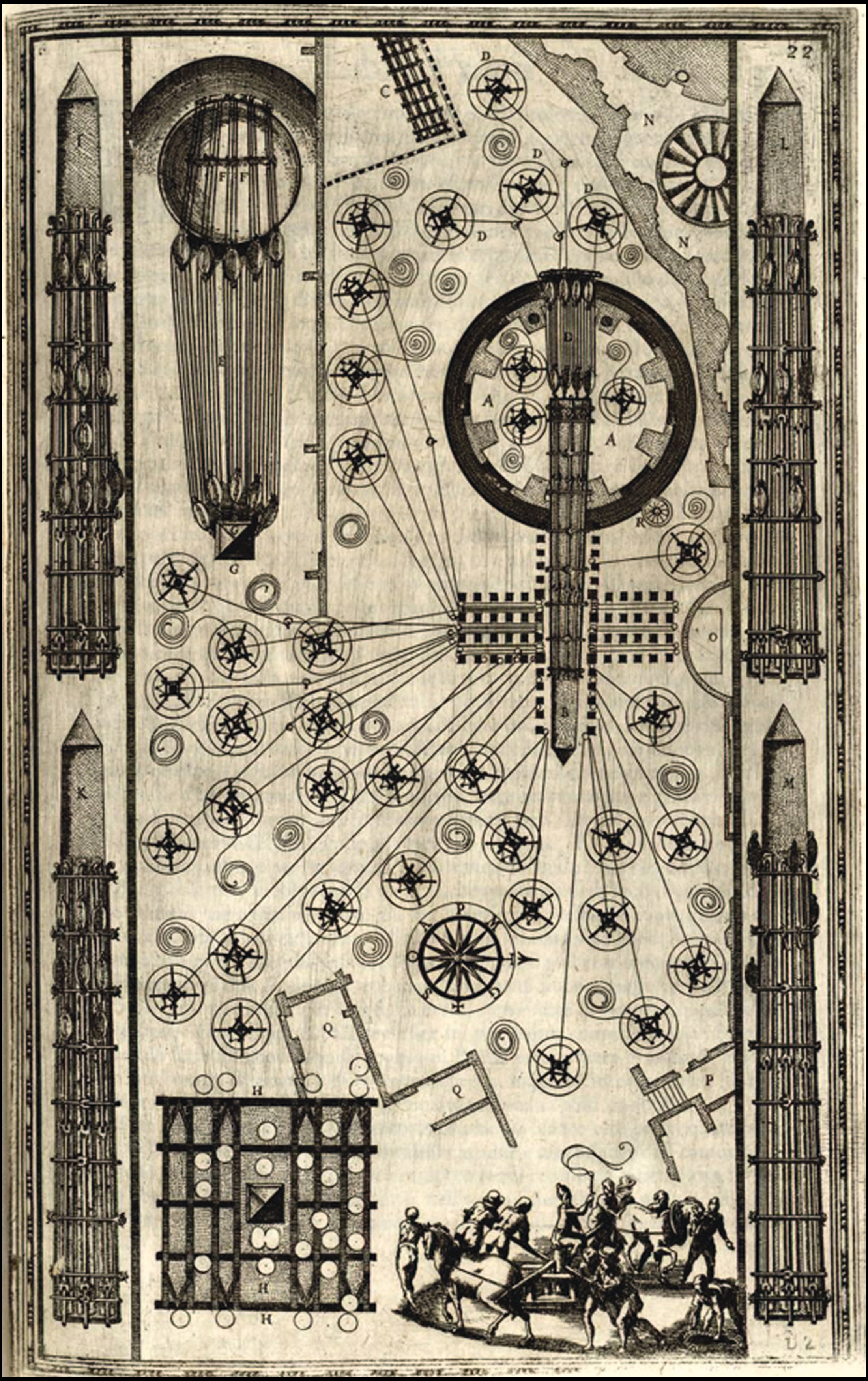

Figure 32 – Re-erection of the Vatican obelisk, 1586 (in Fontana, 1590).

4.1 - Towards a new view of the stelae field

4.1.1 -Stela 1 was properly erected

Another repercussion of our work concerns giant Stela no. 1. This stela, having fallen on the ground exactly like Stela 2, is frequently considered as a "failure": according to this view it tipped over during the erection process and was left in that state, offering to the view of all and sundry the image of a monumental misadventure.

Phillipson (1994; 2000: 222) supported the idea of a failed erection of the stela, an opinion already presented by Van Beek (1967). Here are the arguments employed:

1. The stela, three times heavier than any other at Aksum, must have been intended for erection in loose rocky soil or at a level at least 9.3 m below the end of the ramp on which it was positioned.
2. Only 2.8 m (8.5 % of its total length) was intended to be set in its socket: far too little to achieve stability.
3. Some stratigraphic elements enable the assertion that the stela had fallen in the late 4th century AD (coins of Ouazebas; see de Contenson, 1959: 29-32).
4. There is no trace of the stela's base plates: they would undoubtedly have been present if the erection had been completed.
5. The fall and the fracture of the western portal of the Mausoleum are probably due to the vibrations caused by the fall of the stela and took place before significant deposits had accumulated in the western courtyard.

Let us briefly address these arguments. The first is invalidated, as it does not take into account the fact that, as in the case of Stela 2, the Aksumite constructors had created an enormous foundation formed of a mechanically resistant artificial substrate; in addition, we see neither technical reason nor stratigraphic evidence to suggest the existence of a ramp. The second argument attributes the fall to the maladroitness of the Aksumite constructors who had buried only a small portion of the total length of the stela. However, we have demonstrated that Stela 2, which was erected with success, was in fact set up totally above the working surface.

To consider the third argument, it is preferable to re-examine the information at the source (de Contenson, 1959a). The French archaeologist evokes the discovery of fragments of Stela 1 which had exploded on impact and were found in what he designates "level II" posterior to the terrace wall M1: the latter "was thus already to a large extent masked when the rare architectural elements attested in [level II] occurred"(de Contenson, 1959a: 29). The author then goes on to point out that we must take into account the violence of the impact: the stones discovered deeply inserted into this level may perfectly well postdate it, and, in any case, "it is not possible to accurately state the period during which the collapse took place[6]" (de Contenson, 1959a: 29). In addition, far from dating this level to the end of the 4th century, the 35 coins found in "level II" (of which no more than eight can be attributed to King Ouazebas) correspond to a period running from the reign of this king to the end of the 6th century. This argument is therefore more in favour of a late fall of the stela.

The fourth argument is that of the absence of the base plates. In the case of Stela 2, we have seen that the southern plate was preserved, trapped beneath the fallen stela. We could therefore expect to find a plate, or elements of one, beneath Stela 1, or in the courtyard between the

6. Phillipson apparently failed to correctly understand the text, as he wrote that «*it might imply that the fall of Stela 1* [...] *had already taken place by that time* [late fourth century], *as proposed by de Contenson*" (Phillipson, 2000: 160).

Mausoleum and the East Tomb (terminology from Munro-Hay, 1989). But this is not the case. However, if we decide to follow the reasoning consistent with imagining a stela having collapsed during erection, we must then *equally* explain the disappearance of the base plates, which would in any case have been prepared and in proximity to the stela at the moment of its aborted erection. We will also see later that we can use Phillipson's argument in another way.

Finally, the fifth argument links the damage caused to the western portal of the Mausoleum with the fall of the stela and explains the small amount of sedimentation by almost synchronous construction phases. It is simpler to imagine that this sector may have been covered, which would for a time have protected it from sedimentation.

The arguments supporting the hypothesis of the fall of the stela during its erection seem to us rather unconvincing. We propose an alternative, technical, hypothesis. For anyone having experience of setting up monoliths[7], it is clear that the maximum lifting force must be applied at the moment at which the block is most horizontal, the forces required then decreasing proportionally as the block approaches the vertical. When the monolith is almost vertical, it is relatively easy to maintain it upright, and even to modify its vertical position by applying a minimum of force to the summit. In the case of Stela 1, we note that it fell towards the south, in a line with its erection from the north, or in other words having achieved the vertical position intended. Did it perhaps exceed this point, falling "forwards", as a result of a swaying movement? The fact that it fell perfectly in line tends to indicate that it had first been perfectly upright, sitting on its pedestal. The upright stela awaiting the construction of the locking system is perfectly maintained by innumerable ropes; a simple guying system would then secure the construction during the time necessary for its consolidation and even settling. There is no likelihood of an accident during this period: if an accident had taken place, it would have been during the erection process, and the stela would have fallen pointing towards the north. So what happened?

4.1.2 - Was Stela 1 felled?

The archaeological elements collected from the stelae field, while incomplete, enable us to propose a construction schedule conflicting with those previously proposed. Let us first imagine major preparations: sometimes between the mid-3rd century and the end of the following century, a huge working area was cleared (including any older stelae etc.) and, perhaps, levelled out. Deep foundations were dug and constructed in stone on the sites of the future stelae, substituting for the overly fragile rock a sort of very resistant artificial substrate. It is probable that the three stelae (1, 2 and 3) which are aligned formed part of the same architectural programme (figures 23 et 33), and their construction may have taken place over a relatively short duration (a few years?), benefiting from the encounter between a powerful architectural ambition and the mobilisation of both original know-how and a seasoned workforce. The three stelae, set up above the ground surface, were all maintained in place by stone podiums around 2.80 m high, topped with base plates, which acted as altars and to which access was obtained by means of staircases. In the case of Stela 1, two enormous underground structures, the Mausoleum and the East Tomb, were installed on the southern side, opposite each other, at the level of the stela foundation and at the

7. The author of this article has undertaken the experimental erection of more than 150 monoliths and has experimented with transporting megaliths of up to 32 tonnes in a variety of contexts and using archaic techniques (Poissonnier 1995, 1999, 2000).

same time as the terrace wall M1. This latter delimits, exactly parallel with the three monoliths, a great terrace whose upper level must have been somewhere between the construction level of the stelae and that of the base plates; perhaps 1.50 or 1.80 m below their surface. It should also be noted that the axis of another monument, the Nefas Mawcha, is the same as that of this wall and thus of the alignment of the three stelae, which reinforces the impression of a coherent organisation, at least for some time, of the architectural assemblage (figure 34). The funerary assemblage was used, the pit graves were dug at the base of Stela 2, and the Mausoleum received funerary deposits, perhaps for a short period, while the tomb seems to have remained if not incomplete at least unused, as also seems to have been the case for the Nefas Mawcha.

Next, at an unknown date, perhaps concomitant with the abandonment of the Mausoleum, Stela 1 collapsed (figure 35). And this is where we can re-examine Phillipson's argument concerning the absence of the base plates: if the stela collapsed without a plate, at least on the southern side, and perfectly in line with its original erection, it is because this securing mechanism was removed before the monolith was deliberately felled by being pulled towards the south. This explanation has the merit of taking into account the technical observations linked to the current position of the stela and of explaining why some or all of the remains had not been removed. These remains are perhaps not the indicators of a great architectural failure, but those of a destructive motivation, whether political or religious.

Later, during the 7th century, at the end of the Aksumite period, Stela 2, mined by thieves in search of precious objects from the underground tombs, collapsed accidentally and only Stela 3 remained upright until the recent return of Stela 2, no doubt fatigued from its Roman holiday.

Figure 33 – Looking east; the three stelae in alignment.
Stela 3 is perfectly hidden by Stela 2 (photograph A. Daussy).

Figure 34 – View of "Nefas Mawcha", the enigmatic megalithic structure, in the foreground.
In the background, the reconstructed terrace wall M1 and great Stela 3 (photograph: B. Poissonnier, 1996).

Figure 35 – Assemblage of the three stelae 1, 2 and 3 after the re-erection of Stela 2.
Stela 3, which is leaning, is guyed (photograph: A. Daussy).

Acknowledgments

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