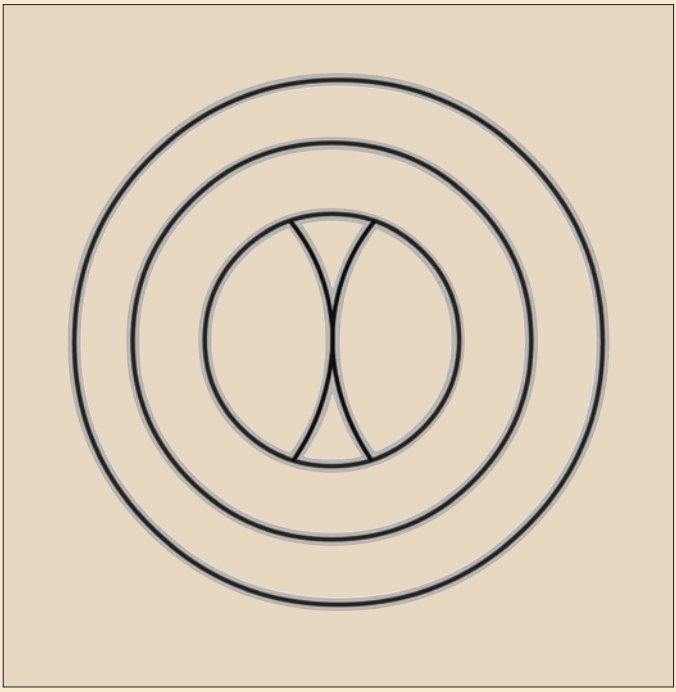
ALMOGAREN

46-47/2015-2016



INSTITUTUM CANARIUM

ICDIGITAL | Separata 46-47/10

ICDIGITAL

Eine PDF-Serie des Institutum Canarium
herausgegeben von
Hans-Joachim Ulbrich

Technische Hinweise für den Leser:
Die vorliegende Datei ist die digitale Version eines im Jahrbuch "Almogaren" gedruckten Aufsatzes. Aus technischen Gründen konnte − nur bei Aufsätzen vor 1990 − der originale Zeilenfall nicht beibehalten werden. Das bedeutet, dass Zeilennummern hier nicht unbedingt jenen im Original entsprechen. Nach wie vor unverändert ist jedoch der Text pro Seite, so dass Zitate von Textstellen in der gedruckten wie in der digitalen Version identisch sind, d.h. gleiche Seitenzahlen (Paginierung) aufweisen. Der im Aufsatzkopf erwähnte Erscheinungsort kann vom Sitz der Gesellschaft abweichen, wenn die Publikation nicht im Selbstverlag erschienen ist (z.B. Vereinssitz = Hallein, Verlagsort = Graz wie bei Almogaren III). Die deutsche Rechtschreibung wurde − mit Ausnahme von Literaturzitaten − den aktuellen Regeln angepasst. Englischsprachige Keywords wurden zum Teil nachträglich ergänzt. PDF-Dokumente des IC lassen sich mit dem kostenlosen Adobe Acrobat Reader (Version 7.0 oder höher) lesen.

Für den Inhalt der Aufsätze sind allein die Autoren verantwortlich.
Dunkelrot gefärbter Text kennzeichnet spätere Einfügungen der Redaktion.

Weitere Informationen und Kontaktmöglichkeiten:
institutum-canarium.org
almogaren.org

Abbildung Titelseite: Original-Umschlag des gedruckten Jahrbuches.

Inhaltsverzeichnis

(der kompletten Print-Version)

Zitieren Sie bitte diesen Aufsatz folgendermaßen / Please cite this article as follows:

Lee, Georgia; Horley, Paul; Bahn, Paul; Haoa Cardinali, Sonia; González Nualart, Lilian; Cuadros Hucke, Ninoska (2016): Secondary applications of rock art at coastal sites of Easter Island (Rapa Nui).- Almogaren 46-47 / 2015-2016 (Institutum Canarium), Wien, 157-209

Almogaren 46-47	Wien 2016	157 - 209

Georgia Lee, Paul Horley, Paul Bahn, Sonia Haoa Cardinali,
Lilian González Nualart & Ninoska Cuadros Hucke

Secondary applications of rock art at coastal sites of Easter Island (Rapa Nui)

Keywords: Easter Island, Rapa Nui, rock art, secondary carvings

Abstract

The change from ancestor worship to birdman cult on Rapa Nui was accompanied by large-scale actions aimed at the erasure and replacement of old ideological symbols with new ones. As a result, the toppled statues and *pukao* were carved with secondary petroglyphs. Apart from simple cupules, the second most frequent carving motif at coastal sites depicts a stylized canoe, which is sometimes developed into a double outline boat. The same motifs were carved on the red scoria facia of the *ahu* at Vinapū, Akahanga and ‘One Makihi, suggesting contemporaneity with the carvings appearing on toppled *pukao*. These secondary canoe petroglyphs may possibly have been connected with visiting ships and their life-boats that reached the coast. The study of the original drawing by Duché de Vancy suggests that the canoe carvings adorned the facia of the *ahu* with standing statues, that is, when the ancestor worship cult was still alive. The case of *moai* Paro with a ship carved on its abdomen when the statue was standing supports this observation.

Zusammenfassung

Der Wandel von der Ahnenverehrung zum Vogelmann-Kult auf Rapa Nui (Osterinsel) wurde von umfangreichen Handlungen begleitet, die auf Auslöschung und Ersatz alter ideologischer Symbole durch neue abzielten. Aufgrund dessen wurden die umgestürzten Statuen und *Pukao* (Hut/Haarknoten) mit nachträglichen Petroglyphen graviert. Neben einfachen Näpfchen stellt das zweithäufigste Gravur-Motiv an küstennahen Stätten ein stilisiertes Kanu dar, welches manchmal auch als Auslegerboot gestaltet wurde. Die gleichen Motive wurden auf die roten Schlacke-Steinblöcke auf den Ahus (Plattformen/Kultstätten) bei Vinapū, Akahanga und ‘One Mahiki graviert und legen Gleichzeitigkeit mit den Gravuren nahe, die auf umgestürzten *Pukao* auftauchen. Diese nachträglichen Kanu-Petroglyphen könnten möglicherweise mit dem Besuch von Schiffen und ihren Landungsbooten, die die Küste erreichten, in Zusammenhang stehen. Die Untersuchung der ursprünglichen Zeichnung von Duché de Vancy legt nahe, dass die Kanu-Gravuren die Steinblöcke der Ahus mit stehenden Statuen verzierten, das heißt, als der Kult der Ahnenverehrung noch am Leben war. Der Fall des *Moai* Paro, dem ein Schiff auf den Bauch graviert wurde, als die Statue stand, stützt diese Beobachtung.

Resumen

El cambio de la veneración de los ancestros al culto de hombre-pájaro en Rapa Nui fue acompañado con los acciones de gran escala intentando de borrar y reemplazar los símbolos ideológicos anteriores con los nuevos. Debido a esto, las estatuas y los *pukao* tumbados fueron adornados con los petroglifos secundarios. Adicionalmente a las cúpulas, el diseño más frecuente observado en las zonas costeras de la Isla representa una canoa estilizada, el cuál fue desarrollado en el diseño hasta una lancha de doble contorno. Los diseños similares fueron grabados sobre la facia de escoria roja de los *ahu* en Vinapū, Akahanga y ‘One Makihi, sugiriendo que estas decoraciones son contemporáneas con los grabados sobre los *pukao* tumbados. Los petroglifos secundarios de las canoas pudieron haber sido conectados con los navíos que han visitado la Isla y con sus lanchas que llegaron a la costa. Los estudios del dibujo original de Duché de Vancy sugiere que los grabados de canoas existían sobre las fachadas del *ahu* con las estatuas erigidas, o sea, cuando el culto de veneración de los ancestros fue todavía activo. El caso del *moai* Paro con el barco grabado en su abdomen cuando la estatua fue todavía parada confirma esta observación.

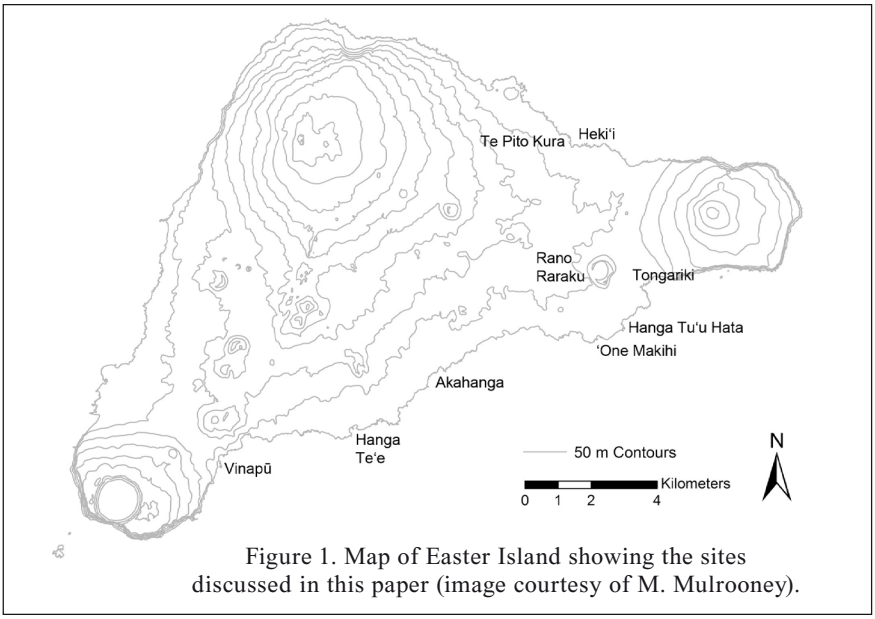


Figure 1. Map of Easter Island showing the sites discussed in this paper (image courtesy of M. Mulrooney).

On Rapa Nui (Easter Island), artistic creativity reached a truly monumental scale with the famous *moai* statues produced in their hundreds in the quarries of the extinct volcano of Rano Raraku, which were transported around the island and installed on carefully built ceremonial platforms, *ahu*. At a later stage, these figures − which most possibly represented venerated ancestors − were adorned with red scoria cylinders, *pukao*, that represented either stained hair or headgear of high-ranking individuals. The monumental sculptures

captured the attention and imagination of many generations world-wide, starting with Jacob Roggeveen and his crew who discovered the island for the Old World in 1722 and continuing up to today, with thousands of tourists visiting the Island. The rock art of Rapa Nui, though not as visually prominent as the colossi of volcanic tuff, is truly overwhelming in both quantity and quality. With several thousand designs (Lee 1992: 4) that vary greatly in themes and mastery of execution, it is the most diverse and elaborate in the whole of Polynesia (Lee and Stasack 1999: 161-69). The preferred surfaces for rock carvings were fine-grained lava flows or *papa*, offering the carvers enough space to apply their skills by creating complicated petroglyph compositions. It can be said for sure that many such carvings were associated with myths or legends, some of which are still remembered today (Lee and Ika 1999). Other petroglyphs might have served as markers, signs of power, delimiters of clan territory, *tapu* markers, and so on.

The times of peaceful production of the statues and construction of ceremonial platforms all around the island did not last forever. At a certain moment, the culture of Easter Island underwent a most dramatic change. Multiple theories have been suggested regarding the possible causes that were capable of causing the disruption of social order on such a large scale; the most frequently cited are overuse of resources, disappearance of the forest, prolonged drought, overpopulation, and also stress induced by contact with the first European visitors. It is unclear whether a single cause was sufficient to bring about the observed cultural changes, or perhaps it was an accumulated effect of several causes. It seems that the power of the traditional king was no longer sufficient to enforce order, bringing the population into inter-tribal warfare, and channelling power to the fierce warrior leaders or *matato'a*. Under these conditions, it is understandable that the large statues proudly standing on their platforms were an obvious target for the attacks of the conquerors. The statues were brought down and broken to destroy their magical power, *mana*, cutting off the place and the related villagers from the spiritual support of their ancestors. Such actions naturally produced heartfelt anger and cries for revenge, so that in several decades all the statues were toppled, the only exceptions being the *moai* standing in the quarries of Rano Raraku, half-buried in accumulated silt. The expedition reports of the European visitors, from Roggeveen in 1722 to Du Petit Thouars in 1838, clearly illustrate the diminishing numbers of standing statues from one visit to another (Heyerdahl 1961: 45-67; Bahn and Flenley 2011: 243-44), until all of them were finally toppled.

The new order brought in new art – the motifs of the birdman *tangata manu* and face masks of the god Makemake – that appears in great profusion on the

rocks of the sacred precinct of Mata Ngarahu at ʻŌrongo, the ceremonial village that was the centre of the annual ceremonies aimed at electing the sacred birdman (Routledge 1919: 254-66). This competition involved climbing down the cliff of Rano Kau from ʻŌrongo to the foamy surf, and swimming to the islet of Motu Nui, where the migrating seabirds were nesting, in search of the first egg of the sooty tern or *manutara*. In the early period of the birdman rites, the competitors possibly performed all actions by themselves. In the later period, the candidates nominated their proxies or *hopu* to do the job. The winning *hopu* returned to ʻŌrongo with the sacred egg and passed it to his employer, who would thus become the sacred birdman for a year.

The change in the social order on the island was also reflected in the re-use of the *moai*, *pukao* and slabs of the *ahu*, which was a logical manifestation of a new ideology striving to erase or disable the monuments of the previous ideology. At 27 sites island-wide, petroglyphs as secondary applications were recorded. Remarkably, the red scoria objects were one of the primary targets for secondary carvings − in part due to the softer material that permitted faster carving with less effort, and also due to the pronounced ritual connotations of the colour red (Lee 1992: 126). The distribution of the secondary carvings around the island is not uniform, suggesting that certain sites were more important for manifestations of the new art. We are sure that these carvings were made at a later date because the orientation of the motifs matches the present position of the desecrated objects. In some cases, the topknots and stone slabs of the *ahu* were further manipulated after the carving. The secondary petroglyphs were also reported on top of the heads and on bases of the toppled statues at Hanga Roa (Heyerdahl and Ferdon 1961: Pl. 67c), Huri a Urenga (Mulloy 1997: 51) and Ahu Akivi (Mulloy and Figueroa 1978: 163, Fig. 5), as well as on *pukao* blanks at Puna Pau and some statues at the quarries of Rano Raraku and in-transit *moai* located in the vicinity thereof (Lee 1992: 104-07, 122-26).

We performed a detailed study of the archive material from the expeditions of La Pérouse, Palmer and Thomson (who visited Rapa Nui in 1786, 1868 and 1886, respectively), analyzing them together with the data and photographs produced in the framework of the Rapa Nui Petroglyph Documentation Project carried out in the 1980s (Lee 1986, 1992). New documentation techniques such as photogrammetric reconstruction of archaeological objects from a set of digital photographs (Kersten and Lidstaedt 2012) were also used. For 3D modelling and visualization we used Agisoft Photoscan and MeshLab from Visual Computing Lab − ISTI − CNR. Each 3D model contained about 2 million faces. The dimensions of the *pukao* and facia slabs were obtained from site maps and drawings (Mulloy 1961: Fig. 133; Smith 1961: 186, Fig. 50; Lee 1992: 125, Fig.

4.133; Van Tilburg 1994: 80, Fig. 62) or calculated relative to the size of the nearby *moai* (Shepardson 2009). To make the carving stand out from shadows and lichens, we rendered the models in isometric projection without any texture. Further improvement was achieved by applying the method of ambient occlusion that was originally developed to enhance image quality in motion pictures (Landis 2002). We used the ambient occlusion filter implemented in MeshLab. The calculated intensity assigns a brighter tone to the points located at the surface that can collect light from different directions. Points located at the bottom of cavities are rendered darker as they are reachable only by a few light rays. This approach is beneficial for the study of deep carvings in red scoria due to the softness and porosity of the material. In the case of thin shallow contours corresponding to incised designs this technique may be not so efficient. In this paper, we focus on secondary petroglyphs and paintings applied to *moai*, *pukao* and facia of the *ahu* located in the coastal area (Fig. 1). For convenience, the sites are described in a counter-clockwise direction from Vinapū to Te Pito Kura. Individual statues and topknots are referenced in accordance with the online databases (Shepardson 2009; Lipo and Hunt 2009).

The ceremonial centre of Vinapū is special in many ways. It features two remarkable *ahu*, one of which − Ahu Tahiri − is definitely a masterpiece of Easter Island masonry with its carefully fitted and smoothed basaltic slabs. The fragment of the first known *moai* eye inlay was excavated at Vinapū in 1955-56. However, being a fragment representing less than half of an entire eye, it was misidentified as part of a coral bowl (Mulloy 1961: Fig. 46). Due to its proximity to Rano Kau and Hanga Roa, Vinapū was frequently sighted from the ships circumnavigating the island and described in the reports of several early explorers. The site was in good condition in 1774, according to the account of Johann Reinhold Forster and his son Georg Forster:

"We reached the east side of the island, near a range of seven pillars or statues, of which only four remained standing, and one of them had lost its cap. They stood on a common pedestal, like those which we had seen on the other side, and its stones were square and fitted exactly in the same manner. Though the stone of which the statue itself is formed seems to be soft enough, being nothing but the red tufa which covers the whole island, yet it was incomprehensible to me how such great masses could be formed by a set of people among whom we saw no tools; or raised and erected by them without machinery. The general appellation of this range was Hanga Tebòw; hanga being the word which they prefix to every range. The names of the statues were Ko-Tomoaï, Ko-Tomoèeree, Ko-Hòo-oo, Morahèena, Oomarèeva, Weenâboo, Weenapè" (Forster 1968: 336).

The name Hanga te Pau corresponds to the bay that faces Vinapū valley. According to Forster, four statues were still upright, most possibly on Ahu Tahiri (Ahu Vinapū 1), three of them still with *pukao*. No statues standing on the *ahu* survived past the mid-19th century. John Linton Palmer, who visited Vinapū in 1886, reported that an improvised shelter was constructed under three toppled *moai* of Ahu Tahiri (Fig. 2). Palmer produced several water-colours of the shelter's interiors (Figs. 2 and 3), documenting crescent shapes on the chest of the central statue and on the flank of the rightmost statue forming the ceiling of the shelter; both designs still survive today. The crescent shape painted with red earth on the chest of *moai* 02-210-02 is a simple stylized canoe. The complex painting on the flank of statue 02-210-03 represented a red-and-white canoe with a white anthropomorph on board. At present, only a white canoe shape can be clearly seen, with some smudges of white in the place where Palmer's anthropomorph once stood. A roughly rectangular red shape is seen to the left of the boat's centre (Fig. 3). It is worth noting in particular that the paintings were made on the ceiling slabs of the shelter, which happened to be toppled statues. Therefore, they cannot be considered to be part of an original painting pattern applied to *moai*, as conjectured by Lavachery (1939: Fig. 424). Indeed, the canoe painted on the chest of the statue 02-210-02 would appear upside-down on the standing *moai*. However, some parts of the statues in a few sheltered locations around the island do preserve traces of pigment, from which one can deduce that at least some *moai* standing on the *ahu* were painted in the past (Bahn and Flenley 2011: 236-38).

The neighbouring platform, Ahu Vinapū 2, was partially excavated by Mulloy (1961: 115-19), revealing several red scoria slabs that once formed the facia along the front wall of the *ahu*. Some of red scoria objects associated with the *ahu* have secondary carvings. Topknot #5 (Fig. 4, top) features a canoe carving, an outline that can be tentatively interpreted as a phallic symbol (?), and a shape that was previously identified as a sitting anthropomorph (Van Tilburg and Lee 1987: 142, the 5th petroglyph for Ahu Vinapū 2 illustrated in the table). The latter identification is not completely evident from the 3D model (Fig. 4, bottom). However, the curve marking the spine of the would-be anthropomorph looks quite similar to a canoe design carved at an angle. This petroglyph may suggest that topknot #5 did not land with its base flat to the ground, but rather spent some time lying on its side. During this period, a canoe carving was added to it. Later, the topknot was moved to its present position marking the corner of the *ahu* ramp (Mulloy 1961: Fig. 133), and new motifs were added to it. To counteract the tilted appearance of the first canoe carving, the design was expanded with new curves. One of *ahu* facia slabs is

carved with an elegant canoe motif (Fig. 5, top). In front of the platform, there is a rectangular paved area associated with a half-buried topknot (Fig. 5, bottom). The sunken concavity originally intended to embrace the top of the statue's head, was deepened to 31 cm (Mulloy 1961: Fig. 35), turning the topknot into a kind of ceremonial basin. Palmer compared this topknot to a similar structure at Ahu Akahanga (Palmer 1870: 179). The side surface of topknot #4 is completely covered with large cupules and over 20 interlacing canoes (Figs. 6 and 7). The rollout tracing of the entire side surface of this topknot has been published elsewhere (Van Tilburg and Lee 1987: 145, Fig. 7). The orientation of the canoes matches the present orientation of the *pukao*, proving that they were not part of the original embellishment of the topknot crowning a statue.

Excavations at Ahu Vinapū 2 in the 1950s revealed two petroglyphs incised on the sea wall slabs. These are still visible today, but the details of the carving are difficult to discern due to the shallowness of the incisions. For this reason, we accompany the photographs with the corresponding tracings (Figs. 8, 9), drawn with reference to photographic documentation made by the Norwegian Archaeological Expedition (Mulloy 1961: Pl. 12b, a). The first carving represents a crescent-shape canoe with a long curved appendage. The canoe's hull has sufficient width and depth to be visible from a distance under favourable illumination. The appendage is incised with a very fine double outline that is really hard to see. We were lucky to document the slab when the sun was practically in zenith, revealing another faint contour reminiscent of a crescent-shaped canoe on the same slab, overlooked by Mulloy. This design is shown by a dashed line in Fig. 8. The second incised motif (Fig. 9) depicts a historical vessel with a square sail and a crescent-shaped hull. The design is so faint that it would be really complicated to find it in the field without a priori knowledge about its location (Mulloy 1961: Pl. 12a).

Ahu Hanga Te‘e (Vaihū) has a large circular area in front of the platform (Fig. 10, top) that was used for *paina* ceremonies dedicated to the memory of a dead parent. As the central attribute of the ceremony, a large anthropomorphic figure was constructed: "*Tapa* cloth was sewn onto the conical framework and painted. The head was made separately, and consisted of a framework of wood and reed covered with *tapa* cloth. The mouth was left open so that the man who climbed into the figure could see and speak ... He passed his head through the mouth of the *paina* and delivered a long speech to the crowd thronged in front of the *ahu*. He spoke of the dead, exalting his virtues and praising his memory" (Métraux 1940: 344-45). The eight statues of Ahu Vaihū were toppled forward; some of them, in addition to breakage due to the fall,

bear the traces of further mutilation. A remarkable example of this is *moai* 06-255-02, featuring deep gashes at the bottom of its body, covering the area where the hands and the loincloth or *hami* are situated. For some reason, these wounds were filled with irregular pieces of red scoria (Fig. 10, bottom)

The topknots that once crowned the statues are scattered in front of the *ahu*, some of them having ended up in the nearby bay of Hanga Te‘e (Fig. 11, top). They might have arrived there either by free rolling after the fall or as a result of deliberate manipulation. The latter is a more feasible scenario, as one of these topknots features carvings on the side that was below the water surface. Heyerdahl cites these "topknots in water of a prepared channel" (Heyerdahl and Ferdon 1961: Pl. 62) as a possible evidence for using boats in *pukao* transportation. However, the relatively short distance from Puna Pau offers convenient dry land access to Ahu Vaihū. Topknots #18 and #19 were recovered from the shallow bay in 1986, offering a complete view of *pukao* #18 and its complex composition of curvilinear contours (Fig. 11, bottom). It is difficult to disentangle individual motifs when looking at the photograph of the topknot as it stands on the shore. However, the archival photographs illustrating this topknot half-submerged allow the tentative identification of several carvings as crescent-shaped canoes.

Akahanga is one of the most prominent sites on the south coast, comprising several platforms merging into a ceremonial construction with over a dozen associated *moai*. Not all of them were standing at the same time − there is evidence that the smaller statues of the leftmost platform (all without topknots) were already toppled when the statues on the central and rightmost platforms were upright, all wearing their *pukao* (Van Tilburg 1994: 79-81). Akahanga is frequently mentioned in island lore as the place where the first king Hotu Matu‘a was buried (Routledge 1919: 280), and where one of the last kings, Ngā‘ara, was held captive for five years with his son Kai Mako‘i and grandson Maurata (Routledge 1919: 246).The remains of a large settlement and a modified cave shelter in front of the *ahu* provide the evidence supporting the site's high status.

The central and the rightmost platforms of Ahu Akahanga have red scoria facia, many slabs of which still survive today. Seven of these are embellished with carvings; they are denoted in the literature with capital letters A-G in succession, starting from the right side of the *ahu* (Van Tilburg 1994: 80, Fig. 62). The decorated slabs are clustered in two groups (Fig. 12): slabs D-G are located around three toppled *moai* on the central platform, and slabs A-C belong to the right side of the platform. 3D models rendered with ambient occlusion filter are a great help in discerning multiple boat motifs carved into

soft scoria (Figs. 13-16). Slabs G, F, and D have a considerable number of cupules. Facia slab D, located to the left of *moai* 07-584-04, is remarkable. It was documented by the USS *Mohican* Expedition of 1886 (Fig. 14). The carving seemingly depicts a marine creature − with possible interpretations ranging from crustaceans to squids. The slab is considerably eroded, so that the photographic record is insufficient for detecting all the contours as published by Thomson (1891: 510, Fig. 19). The 3D model rendered with ambient occlusion clearly highlights the majority of the outlines, including the dorsal and caudal fins. At the same time, one can clearly see that the entire motif was constructed from intersecting canoe motifs − the deeply carved canoe with curved extremities that defines the contour of the belly and the caudal fin, and a conjoined canoe of similar size but far shallower, corresponding to a long antenna/tentacle attached to the creature's head.

Facia slab C illustrates the limitations of the 3D modelling technique when it comes to distinguishing traces of shallow carvings on a very large object. The slab is decorated with two curved canoes and a faint eye mask between them (Van Tilburg and Lee 1987: 144, Fig. 5). The face is discernible in photographs and on the textured model, but its grooves are too shallow to be seen clearly in the image rendered with the ambient occlusion filter (Fig. 15). The same is true to a certain degree of a rectangular sail placed above the rightmost canoe, which is clearly seen in the textured model but is barely discernible in the ambient occlusion rendering. In contrast, every cupule on this slab is significantly highlighted in the textureless image. The rightmost canoe shape appearing on slab B has its extremities extended to a degree that almost turns it into a circle (Fig. 16, top). The adjacent slab A is tilted from its original position (Fig. 12, bottom), with the carved surface pointing practically downward. The photographic documentation was performed standing in front of the *ahu*, resulting in a very acute angle between the line of view and the carved surface of the slab. Nevertheless, the photogrammetric reconstruction was successful (Fig.16, centre), clearly showing three canoes joined by their curved extremities (the possible fourth canoe on the left side of the slab was blocked from view by vegetation). Remarkably, every canoe is associated with a deep furrow extending from the edge of the slab. Taking into account the uniformity of these furrows (in both length and spacing), it seems plausible to assume that the furrows were carved first (or are remainders of stone-cutting activities) and the canoe designs were added afterwards, curving around the existing structural formations.

There are numerous *pukao* and red scoria fragments scattered landward and seaward from Ahu Akahanga. The best preserved topknots display elab-

orations on cylinder-and-knob geometry (Fig. 16, bottom). Topknot #34 was described by Palmer (1870: 179) as a pillar holding two skulls on its top and looking towards the platform. Among the *pukao* associated with the site, the most remarkable are topknots #35 and #36 located on a precipitous ledge to the right of the *ahu*. Both are decorated with carvings of birds, which are among the most elaborate of all secondary petroglyphs seen on red scoria objects island-wide. These topknots are probably those referred to by Englert (1948: 111): "some of the crowns were marked with figures, made in low relief, the so-called 'rona', with preference for the figures of a 'bird-man'" (translation from Spanish by the authors). Indeed, *pukao* petroglyphs were enthusiastically commented upon by 19th-century scholars as being possibly related to *rongorongo* writing: "on the large cylindrical head-dress of the stone idols of Rapa-Nui are carved quite similar figures as those which are found incised on the tablets" (Miklouho-Maclay 1872: 80). Also, "Palmer (1875: 286) likens topknot signs more to the '1770 signatures' [of the islanders on the Spanish proclamation by Felipe González y Haedo] than to RR [*rongorongo*]; it is uncertain what he means here, especially as *pukao* 'inscriptions' have yet to be published" (Fischer 1993: 180). In his monumental book on *rongorongo*, Fischer explicitly addresses topknot #36: "Some petroglyphs on the *pukao* are indeed *rongorongo* glyphs. Perhaps the best example of this is the toppled *pukao* at *ahu* Akahanga. It is possible that such glyphs were pecked into the fallen *pukao* by *tangata tā* or *rongorongo* experts, in the first half of the nineteenth century" (Fischer 1997: 548). If we are looking for a petroglyph group in which multiple elements have a strong similarity to *rongorongo* glyphs, the carvings on Akahanga topknot #36 can be rivalled only by the richly adorned panel in the *neru* cave of 'Ana o Keke on the Pōike peninsula (Steiner 2008: Pls. 17-24).

The base of topknot #36 rests solidly on the ground; the carvings are added to the landward side of the *pukao*. As one can see in Figure 17, one of the heads of the two-headed bird is carved on a horizontal surface beside the knob that would be invisible to a ground-based beholder when the *pukao* was balanced on the statue's head. Therefore, it is completely safe to conclude that two headed bird and anthropomorphic motif carved on the knob itself were made only after the *pukao* was toppled. The remaining bird carving could be technically visible completely when the topknot was on the statue. However, as it is carved at the same level as the two-headed bird, it seems reasonable to consider that both birds date from the same epoch. At a certain moment after carving, the topknot underwent considerable modification − a large piece of scoria was removed, erasing half of the bird design, and a deep furrow was cut through

the knob, possibly in preparation for splitting the *pukao* following the method apparently used for the neighbouring topknot #35. Remarkably, all carvings adorning topknot #36 are known from surviving *rongorongo* tablets (Fig. 17, bottom). A two-headed frigate bird is recorded in the inscriptions of Tahua, Mamari, Echancrée, Keiti, the Large and Small Santiago tablets, the Santiago Staff, the Large and Small St. Petersburg tablets, as well as the Small Washington tablet. The sitting man with a loop-shaped head occurs in line 7 on side "a" of tablet Tahua, Aa7 in Barthel's nomenclature (1958: 45). The head loop of the character incised on the tablet has radiating lines invoking feathered headgear. These are absent in the petroglyph; however, the porous scoria may have discouraged the carver's attempts to depict finer details. In two instances the text of the tablet Tahua shows a two-headed bird in close association with the sign depicting a *manutara*. The first fragment is in the third line of side "a", Aa3 in Barthel's notation (Fig. 17). The bird in this context holds a pointed object. As the corresponding part of the *pukao* is damaged, it is impossible to confirm the exactness of the match.

The remaining parallel with line 4 of side "b" of tablet Tahua requires a brief additional explanation. The *rongorongo* script is notorious for multiple structured sequences occurring on different scales. There are inscriptions obeying in their entirety certain patterning rules (Fischer 1997: 456-57), there are lengthy lists separated by certain "delimiters" − fixed glyphic groups (Barthel 1958: 304-13), and there are short structured sequences in which the same sign intercalates the fragment (Horley 2013: 52-60). In the latter contexts, the glyphs forming the structured sequence are most possibly devoid of phonetic value. Outside of such structured sequences, these glyphs most likely have a definite reading. The exact role of highly-repetitive glyphs is unknown; they may be a kind of marker assigning a certain property to the glyphic passage − possibly informing the reader that the sign group corresponds to a personal name, place name, taboo word, etc. Taking into account these particularities, the illustrated fragment from Ab4 represents an item in a list delimited with the well-known bigram of a stick sign and an abstract glyph drawn as three vertical lines. These delimiters are marked with brackets above the line. The list item by itself is a structured sequence intercalated with a glyph that seemingly represents a plant. Omitting the repetitive signs as potential inscription markers, one arrives at the sequence of three glyphs: double headed bird − bird − bird. Two initial signs match the sequence of petroglyphs on Akahanga's topknot #36. This possible match is especially remarkable because the illustrated glyphic sequence from line Ab4 represents an item in the frequent structured list that, in addition to Tahua, is also attested on several other

tablets −Mamari, Keiti, the Small Santiago tablet, the London tablet, the Small Vienna tablet and the Large Washington tablet (Fischer 1997: 554). The individual list items can be found on other tablets as well, strongly suggesting that they represent fixed word combinations in the Rapanui language, as one might expect of personal names (Harrison 1873: 380) or place names. Thus, the secondary petroglyphs on topknot #36 have the best chance − in comparison to all other petroglyphs resembling *rongorongo* signs − of comprising a short inscription that appears on surviving *rongorongo* artifacts. The *pukao*'s location at Ahu Akahanga may also be meaningful: king Ngā'ara, held captive at Akahanga, was a prominent *rongorongo* expert (Routledge 1919: 245-46), so that it may be not too far-fetched to speculate that he might have been related in a certain way to the creation of these petroglyphs.

The orientation of the *manutara* motif carved on the nearby topknot fragment #35 (Fig. 18) also suggests carving on a toppled *pukao*. The seaward surface, to a large extent facing downward, features a one-of-a-kind complex design of multiple intertwined contours. The rough upper surface is the product of rough blow-assisted splitting of the topknot, possibly along a pre-formed groove similar to that carved beside the *manutara* motif. After splitting, the half-cylinder *pukao* fragment rocked on its round side to reach equilibrium, hiding the once easy-to-access surface with a carving. After this, the *manutara* motif was carved on the landward side of the topknot. Despite good protection from the elements, the carving on the seaward side is very difficult to interpret due to the heavy mixture of contours (Van Tilburg and Lee 1987: 142, Table 2). 3D modelling considerably helped the new attempt to analyze this petroglyph, because the thickness and depth of the contour lines revealed with the ambient occlusion filter made it possible to disentangle individual motifs, illustrated in the upper panels of Figure 19. The first contour carved on the topknot was that of a statue shown in profile, carefully delineated with a thin shallow contour. The profile view is unusual, as numerous mini-*moai* documented island-wide are always shown in a frontal position (Lee 1992: 54-57). The other motif, carved with a deep and rough contour, depicts a stylized bird inside an oval, perhaps a chicken inside an egg. This iconography is known from painting − a similar image showing a *manutara* inside a red oval once existed at 'Ana Kai Tangata (Lee and Horley 2013: 24). It may be that chicken carving was added to "rewrite" the *moai* carving, possibly even making a graphical pun on the Rapanui word pair *moa* − *moai* (chicken − statue). The most surprising result, however, comes from analysis of the direct surroundings of the topknot #35 (Fig. 19, bottom): the profile of the toppled statue 07-584-01 lying just beside it is remarkably similar to that appearing in the petroglyph.

Thus, the carving on the seaward side of the topknot may be a "portrait" of a real-life statue − a unique example in Rapa Nui rock art.

Another site of importance, Ahu ‘One Makihi, is located close to the Hotu Iti plains. The *ahu* is associated with several *moai* and a red scoria upright #44 standing at the platform (Fig. 20). Many of the red scoria slabs forming the facia of the *ahu* are covered with carvings of canoes (Figs. 20, 21). Some of the slabs feature series of cupules. The nearby site of Hanga Tu‘u Hata is remarkable for its incised carvings of historic ships (Fig. 22; for a tracing of this design, please see Lee 1992: 113, Fig. 4.111). The hull of the upper ship is densely covered with stylized depictions of female genitalia or *komari*. A stylized anthropomorph (with legs carved in a way similar to that seen in *rongorongo* tablets) stands on-board in front of a mast with a triangular sail. The bottom ship clearly shows three masts and square rigging. Tallies of faint notches are incised to the right of the upper ship (in three series containing at least 18, 4, and 9 notches, respectively) and to the left of the bottom ship (a single tally of at least 11 notches). The meaning of these marks is unclear. A more widely known petroglyph of a historical ship with square sails and short notches carved along the gunwale, possibly representing sailors, was discovered on the chest of *moai* RR-049 excavated by Skjølsvold in 1955-56 (Fig. 23). Secondary canoe carvings also decorate in profusion the statues standing in the exterior and interior Rano Raraku quarries (Van Tilburg and Arévalo Pakarati 2012).

Ahu Heki‘i with its 5 m tall sea wall (Smith 1961: 184) and a huge landward ramp is located on the north coast at Hanga o Hōnu (the metathesis spelling Hanga Ho'onu is also popular in the literature). The principal *ahu* and surrounding structures were studied in detail by several research teams (Smith 1961: 184-89; Stevenson and Haoa 1998; Martinsson-Wallin and Wallin 2000; Mulrooney et al. 2009). According to the maps and drawings from the 1770 González Expedition to Easter Island, the Spaniards, anchoring off the north coast, spotted standing statues with *pukao* at the location corresponding to Ahu Heki‘i (Mellén Blanco 1990: 131). This observation (in addition to the orientation of the carvings) confirms that numerous ship petroglyphs appearing on *pukao* and *moai* partially buried in *ahu* mantles definitely represent secondary rock art applications made after the toppling of the statues at some moment after 1770 (Figs. 24, 25). The pronounced manipulation of red scoria objects is noted: *pukao* #61 has a long furrow carved on its lateral surface, possibly preparing it for splitting in line with techniques observed at Akahanga; *pukao* #59 features large ovoid cavities with much material removed from the area around the knob (Fig. 24, bottom). The lateral surface of this topknot has some awkward carvings

approaching crescent-shaped canoe motifs. *Pukao* #57 is carved with double-outline life-boats on its underside, including one motif in a sunken area designed to embrace the top of the *moai*'s head. Remarkably, boat carvings appear upside-down, suggesting that *pukao* #57 was rolled after the secondary carvings were completed (Fig. 25, top). The hip area of statue 31-999-07 was carved with a boat motif, clearly marked in double outline (Fig. 25, bottom). One of the site's interesting features is the red scoria upright #58 (Fig. 26), possibly part of a *pukao*, situated on the ramp of the *ahu* in a way that resembles the red scoria upright #44 of Ahu ‘One Makihi (Fig. 20). The specimen from Ahu Heki‘i is notorious for having two deep cupules carved on its landward face, creating an impression of two eyes staring from the *ahu*. The top surface of the upright is covered with lichens that mask a large cupule carved on its top. Two smaller cupules appear above the "eyes" (Fig. 26). Their purpose is unknown; however, it is possible to speculate that these cupules may have had a role similar to the cup-shaped depressions on the foreheads of skull-shaped cave stones, reportedly used for keeping powdered human bone (Heyerdahl 1975: Pls. 195-200).

The nearby Ahu Te Pito Kura holds the record for the largest *moai* (Paro) ever successfully erected on Easter Island's *ahu*. The height of the statue is about 9.8 m (Smith 1961: 202), and, crowned with a topknot 1.7 m tall (Smith 1961: 203), it must have been a truly magnificent monument. According to folklore, *moai* Paro was the last statue to be overthrown (Routledge 1919: 197). In this case, it seems that the size (and weight) of the *moai* really mattered. It was too heavy to be pushed from the pedestal at ground level, and for toppling by pulling a rope fixed around the statue's neck, it should be remembered that Paro's shoulders were over six metres above the platform − a fact that considerably complicated the task of the vandals. Also, to bring down a standing colossus like this, it would be necessary to use long thick rope, which immediately increases the effort required to fix it high enough on the statue, not to mention the high number of pullers needed to achieve the toppling. It becomes clear that, in contrast to the sites that have smaller *moai* − such as those of Ahu Naunau − the task of bringing down Paro could not have been accomplished in a small night raid by a few warriors; it must have been a large and well-planned military operation that required many people spending a considerable time on the site. But eventually all these conditions were met and *moai* Paro ended up face-down on the ground, broken in half. A small shelter was formed under the toppled statue, with a wall of loosely-laid stones constructed for protection. Numerous cupules were made in both statue and topknot (Fig. 27). Smith (1961: Fig. 57) documented a petroglyph of a two-masted vessel almost a metre wide, carved on the statue's abdomen in such a

way that one of the masts passes through the navel of *moai* Paro. Judging from the orientation of this carving, it was completed when the statue was still standing. If planned exclusively as decoration for the shelter ceiling, the petroglyph should have been carved the other way up.

It is important to mention that the red scoria facia of Ahu Naunau at ʻAnakena, the residence of the traditional king *ʻariki mau*, is devoid of secondary carvings. This might be due to the forward toppling of Naunau's *moai* that reduced access to the facia. The ever-advancing sands of ʻAnakena (eventually covering the entire *ahu*) may also have contributed to keeping the facia in pristine condition. The other possible explanation can be sought in the nature of the ideological change in society − the secondary carvings appear on sites as a consequence of the abandonment of old traditions, the change that accompanied a considerable weakening of the king's powers. Thus, it is logical to expect that the king with his loyal men would do their best to safeguard the royal *ahu* from desecration.

Remarkably, some boat-shaped carvings were recorded by the early visitors. Here we would like to discuss the famous etching "*Insulaires et monumens de l'Île de Pâque*" based on the material gathered by the La Pérouse expedition (Milet-Mureau 1797: Pl. 11; Milet Mureau 1798: Pl. between pp. 70-71). The engraving was made by Godefroy after the field sketch of Duché de Vancy, who joined De Langle's reconnaissance party that ventured inland to study the houses, fields and monuments of the islanders, while La Pérouse's party studied the surroundings of their landing place, Hanga Roa. Godefroy's etching depicts the members of the ships' crew communicating with the islanders and measuring a statue standing on an *ahu* (Fig. 28). It is worth noting that the foreground *moai* has a clearly depicted eye with an iris, in contrast to the empty eye socket of the background statue. It is possible to interpret this detail as "extended artistic licence" by the engraver. Or conversely it may be the first historic depiction of a statue with eye inlays set in place. None of the sketches produced by other early expeditions, to the best of the authors' knowledge, shows the irises of statue eyes. The sketch from the second Cook expedition of 1774 shows empty black eye sockets with no hint of inlays (Van Tilburg 1994: 125, Fig. 97; Bahn and Flenley 2011: 172, Fig. 47). The foreground statue in Fig. 28 correctly depicts a *pukao* projecting over the statue's forehead, with a narrower cylindrical knob on top. However, the clearly-marked realistic eyebrow starting at a distance from the nose bridge is highly uncharacteristic of classical *moai* iconography. The elongated ear is shown as a bar-like object with two round "plugs" that have the potential to give the completely wrong impression that the ear was hewn from a separate piece of rock that was

fastened to the finished statue. The bottom part of the *moai* body is drawn rectangular in cross-section (which is also in contrast to the classical statue shape), and no arms are shown. Finally, the ceremonial platform is depicted as a staircase of large blocks, projecting enough to offer a seat for the person with a quill pen in his hand.

The original sketch by Duché de Vancy is preserved in the Musée de la Marine (Chauvet 1935: Pl. 3, Fig. 5; see also Esen-Baur and Forment 1990: 64; Orliac and Orliac 1995: 18). The main contours and hatching are made with pencil; the watercolour shades were added to provide richer halftones and depict the clouds. The image details of the sketch are more natural (Fig. 29): note the posture of the man reaching for the hat from the back of the *moai*, the shadow of the man cast onto the *moai*'s chest, and the rich texture of the topknot crowning the statue with crevices and pits, in full accordance with the rough surface of the red scoria. Side-by-side analysis of the etching and the sketch (Figs. 28, 29) reveal several important details. The naturalistic eyebrow of the foreground statue in the etching is a consequence of misinterpretation; in the sketch, the eyebrow ridge extends over the statue's nose, casting a dense shadow over the statue's face. The eye socket is deeply outlined, with a clearly-marked lunate curve inside it that may indeed represent the iris. The statue in the background is depicted with less detail, but its eye socket is definitely empty. The lips of both statues are thinner in the sketch, which is more faithful to the original *moai* design. The shapes of statues' ears are also more natural in the sketch. First of all, the intensity of the hatching clearly shows that the ear forms part of the statue. The upper circular contour is smaller, which is completely in line with the stylized depiction of the ear structure seen in *moai*. The bottom circle is considerably larger; the dark outlines create an impression of a circular cavity containing a slightly protruding inlay. If so, then Duché de Vancy's sketch was the first to document the earlobe inlays of the *moai*. The former existence of these adornments can be conjectured from well-marked sockets in the lower part of statues' earlobes at Ahu Tongariki (Fig. 30).

Another important observation concerns the shape of the ceremonial platform. Godefroy's stair-like structure comes from an erroneous interpretation of the sketch. In the original documentation, the rectangular platform is formed by two vertical tiers of slabs. Only the lowest third tier has a frontal projection. The person with a quill in his hand is not sitting on a step, but rather in the space offered by the missing/broken slab from the upper tier. Most remarkably, the facia of the *ahu* is adorned with crescent-shape designs, which appear on three blocks of the upper tier, and on one block of the middle tier. In the survey drawings by Bernizet (Milet-Mureau 1797: Pl. 12, Fig. 9),

the carvings on *ahu* facia are shown in a completely different way, as stick figures turned sideways. The description is as follows: "on several of the stones of which these platforms are composed, we remarked skeletons rudely sketched, and discovered holes closed up with stones, which, as we conjectured, lead to caverns containing the remains of the dead" (Milet Mureau 1798: 80). However, the previously overlooked details of Duché de Vancy's sketch have nothing to do with stick figures; instead, they prominently match the crescent-shaped canoe petroglyphs known from the facia of Ahu Vinapū 2, Ahu Akanahga and Ahu ‘One Makihi.

Which platform was documented in Duché de Vancy's sketch? If we believe that the drawing is 100% accurate, then the *ahu* in question should have several *moai* with topknots and a red scoria facia decorated with canoes, which essentially narrows the choice to Vinapū. We know that the reconnaissance party was there from the map showing the route (Fig. 31) and from the description of a large earthen enclosure "384 feet length by 324 broad" (Milet Mureau 1798: 80), which matches the enclosure in front of Ahu Vinapū 2 (Heyerdahl 1961: 64; Mulloy 1961: 115-35). On the other hand, it may be too naïve to think that the entire sketch was drawn *in situ* − the reconnaissance party had a hard day of walking the rough terrain covering a considerable distance, visiting seven platforms and climbing Rano Kau all the way up to the crater − and one person, Father Receveur, even climbed down to the crater swamp and up the hill again (Milet Mureau 1798:81).

Which other sites they might have seen? A possible hint can be derived from De Langle's description of a *paina* figure: "We found near the last of them [the *ahu* visited] a kind of layman or effigy of reeds, representing a man ten feet high, and covered with a white manufacture of the country; the head of a natural size, the body thin, the legs pretty exactly proportionate, and a net hanging to its neck in the shape of a basket covered with white cloths, and apparently containing grass. By the side of this sack was the figure of a child two feet long, with the arms crossed and the legs hanging down. This layman, which could not have stood there many years, was perhaps the model from which statues are now erecting to the chiefs of their country" (Milet Mureau 1798: 80). De Langle continues with the mention of the earthen enclosure "by the side of this same platform", suggesting that a *paina* figure was also standing at Vinapū. However, there is a slim possibility that they saw the *paina* figure at Ahu Vaihū, which still has its *paina* circle clearly marked (Fig. 10, top). Indeed, comparing the La Pérouse map (Fig. 31) with the modern map (Fig. 1), one can see that the route of the reconnaissance party was to a terrain limited by a round cape on the south coast. This may be either cape Tarakiu west of

Hanga Te'e, or, alternatively, cape Puku Auke to the east of it. In the latter case, De Langle might have seen Ahu Vaihū as well, which fits the description of the "the last platform" in the sense of "the visited platform located furthest from the landing place".

To summarize, it is important to highlight the following. The petroglyph orientations on the *pukao* and *moai* definitely show that these were secondary applications of rock art, completed after the toppling of the statues. However, many of these statues were reported standing by the visitors of the late 18th – early 19th centuries, thus placing the carving of the secondary petroglyph in the 19th century. In line with the change of emphasis from ancestor worship to the cult of the birdman, one would expect to find a profusion of the images of the new cult – the eye masks of Makemake, profile views of *tangata manu* and bird motifs. In a few cases this expectation is fulfilled: there are bird carvings on *pukao* #35 and #36 at Ahu Akahanga, as well as on *pukao* blank #83 at Puna Pau. Several eye masks are known to be carved on the bases/heads of *moai* at Huri a Urenga and Ahu Akivi; there are a few secondary birdman carvings as well. However, in the majority of cases the canoe is the motif of choice for secondary petroglyphs. With a simple crescent shape these motifs may represent any type of watercraft, but the time-frame of their carving after the toppling of the *moai* strongly suggests that these petroglyphs are most possibly related to European vessels and their life-boats rather than to the few leaking sewn-plank canoes of the islanders, as described in the reports of the early visitors. In some cases – as in the Akahanga facia slab C (Fig. 15) – the addition of a rectangle above the canoe shape might have been considered sufficient to identify the carving with a historic ship. In places such as Rano Raraku and Hanga Tu'u Hata, the designs clearly show masts and rigging (Figs. 22, 23). Importantly, many of the secondary petroglyphs appear on red scoria objects located either in places visited by early expeditions or in places with a direct view of anchored ships.

Another interesting insight follows from the drawing of Duché de Vancy: at the time of the La Pérouse visit the canoe carvings on *ahu* facia seemingly *coexisted* with standing statues wearing their topknots. The supporting evidence for this is also the case of the *moai* Paro, carved with a two-masted ship on his lower abdomen when the statue was standing. A possible explanation for the practice of making secondary carvings of canoes on still-functional ceremonial sites of ancestor worship can be suggested, by considering the reaction to the first European visitors elsewhere in Polynesia:

"Petroglyphs of Polynesian canoes ... are reasonably familiar design elements for the Hawaiian petroglyph maker. The ship, a vehicle for transportation, the

conveyance of power and the bringing to the island of new technology undoubtedly possessed *mana* in the eyes of the islanders; it was seen as a 'floating island'. A petroglyph of a sailing vessel or gun ship may have been an effort to simply make a record or, perhaps, to tap into its power ... The impact of Cook's arrival by ship with sails reminiscent of the tapa hung from a wooden cross, symbol of the god Lono ... would be consistent with the veneration Hawaiians held for the *ali'i* [hereditary king]. Recalling the many women who directed their men folk to place *piko* stumps [umbilical cord of newborns] into cracks and crevices of Cook's ships, it is clear that Hawaiians believed the *mana* of a man-god could be extended to his possessions ... Thus a sailing vessel was a suitable subject for the petroglyph, fulfilling one of its most sacred functions: to succor and gain the favor of the gods" (Lee and Stasack 1999: 66).

Therefore, adorning the red scoria facia of an *ahu* or a standing statue with canoe motifs may have been considered as an act increasing the *mana* of the ceremonial site by absorbing and/or channelling the *mana* of the visiting ships. With the toppling of the *moai* in the course of tribal warfare, the tradition of carving canoe motifs persisted (in line with the increasing number of contacts with the outside world), applying the secondary petroglyphs to fallen statues, topknots, and red scoria facia at coastal sites.

Conclusions

We have illustrated a successful use of photogrammetric reconstruction as a non-intrusive method allowing detailed 3D documentation of Easter Island rock art. Ambient occlusion filter offers high-contrast rendering of petroglyphs, which is especially beneficial for the study of deep petroglyph grooves made in soft scoraceous material. The information about petroglyph contour depth has a potential for helping to discern overlapping motifs, allowing the identification of individual carvings composing a complex design on one of the topknots at Akahanga.

Analysis of historical records, photographs and 3D models has brought forth new results about the iconography associated with the changes of social order on Rapa Nui in the late historical period overlapping with the times when the island started to receive frequent visits from the outside world. The pronounced shift in ideology from ancestor worship to birdman cult is clearly seen through numerous secondary petroglyphs "overwriting" the monuments of the old iconography, such as once-sacred statues and their topknots. Surprisingly, the dominant secondary motif represents a crescent-shaped canoe, which appears in profusion as carvings and paintings at the coastal sites of Vinapū, Hanga Te'e (Vaihū), Ahu Akahanga, Ahu 'One Makihi, Ahu Heki'i and Ahu Te Pito Kura. Secondary canoe petro-

glyphs are also known from statues in Rano Raraku and topknots of Puna Pau. Many of these petroglyphs may date from the late 18th to the early 19th century, because the statues wearing these topknots were reported standing by the early visitors (e.g. Forster 1968: 336). The late carving date points to an iconographic association of the secondary canoe petroglyphs with visiting ships and their lifeboats. At several sites (including Hanga Tu'u Hata and Rano Raraku), the carvings explicitly show the square rigging of European vessels. The prominence of the boat motif used in secondary carving emphasizes the need for further detailed study of the cultural impact of early European visitors (in particular those of the 18th century) on Rapanui culture, especially in light of the evidence suggesting that some of the canoe carvings were applied to the functional sacred objects of the ceremonial sites, that is, before the toppling of the statues.

Acknowledgements

The authors greatly appreciate the kind invitation of Hans-Joachim Ulbrich and Hartwig-E. Steiner (Institutum Canarium, Vienna) to prepare the present paper for Almogaren. We are grateful to Olivia Hey Rirorokо (Ilustre Municipalidad de Isla de Pascua, Hanga Roa), Ramón Martínez Tepihe, Graciela Campbell Rirorokо (Rano Raraku Park Rangers) and Melinka Cuadros Hucke (CONAF Rapa Nui) for their kind help with documentation of the sites. Special thanks to Joy Wheeler and Jamie Owen (Royal Geographical Society with the Institute of British Geographers, London), Daisy Njoku and Gina Rappaport (National Anthropological Archives, Smithsonian Institution, Washington D.C.), Reidar Solsvik (Kon-Tiki Museum, Oslo), Mara Mulrooney (Bernice P. Bishop Museum, Honolulu) and Mark Oliver (Rapa Nui Petroglyph Documentation Project) for their kind help with archive materials, photographs and maps of Easter Island and permission to use the corresponding images in the paper. We also acknowledge with deep gratitude the software packages that were instrumental in this research: Agisoft PhotoScan by Agisoft LLC and MeshLab by Visual Computing Lab, ISTI and CNR.

Contributors to this paper and their fields of work:

- Georgia Lee, Easter Island Foundation, Los Osos, Califonia, USA
- Paul Horley, CIMAV Campus Monterrey, Monterrey, Nuevo León, México
- Paul Bahn, archaeologist, writer and broadcaster, Hull, United Kingdom
- Sonia Haoa Cardinali, Mata Ki Te Rangi Foundation, Hanga Roa, Rapa Nui, Chile
- Lilian González Nualart, Mata Ki Te Rangi Foundation, Hanga Roa, Rapa Nui, Chile
- Ninoska Cuadros Hucke, CONAF Rapa Nui, Hanga Roa, Rapa Nui, Chile

References

Bahn, Paul & Flenley, John (2011): Easter Island, Earth Island. Third edition.- Rapa Nui Press, Santiago

Barthel, Thomas S. (1958): Grundlagen zur Entzifferung der Osterinselschrift.- Cram, de Gruyter & Co., Hamburg

Chauvet, Stephen (1935): L'Île de Pâques et Ses Mystères.- Éditions "TEL", Paris

Englert, Sebastián (1948): La Tierra de Hotu Matu'a.- Padre Las Casas, Santiago

Esen-Baur, Heide-Margaret & Forment, Francina (1990): L'Île de Pâques: une énigme?- Museés royaux d'Art et d'Histoire, Bruxelles

Fischer, Steven Roger (1993): A Provisional Inventory of the Inscribed Artifacts in the Three Rapanui Scripts.- in Easter Island Studies: Contributions to the History of Rapanui in Memory of William T. Mulloy, S.R. Fischer (Ed.), Oxbow Books, Oxford. pp. 177-181

Fischer, Steven Roger (1997): *Rongorongo*, the Easter Island Script: History, Traditions, Texts.- Clarendon Press, Oxford

Forster, Georg (1968): Werke: sämtliche Schriften, Tagebücher, Briefe.- Akademie-Verlag, Berlin

Harrison, J. Park (1873): The Hieroglyphics of Easter Island.- in Journal of Anthropological Institute, Vol. 3, London, pp. 370-382

Heyerdahl, Thor (1961): An Introduction to Easter Island.- in Archaeology of Easter Island: Reports of the Norwegian Archaeological Expedition to Easter Island and East Pacific, Heyerdahl, Thor & Ferdon, Edwin Jr., Eds., Monograph of the School of American Research and the Museum of New Mexico, Number 24, Vol. 1.- New Mexico, Santa Fe, pp. 21-90.

Heyerdahl, Thor (1975): The Art of Easter Island.- Doubleday & Company, Inc., New York

Heyerdahl, Thor & Ferdon, Edwin Jr., Eds. (1961): Archaeology of Easter Island: Reports of the Norwegian Archaeological Expedition to Easter Island and East Pacific, Monograph of the School of American Research and the Museum of New Mexico, Number 24, Vol. 1.- Santa Fe, New Mexico.

Horley, Paul (2013): The Large *rongorongo* Tablet from the Collections of the Smithsonian Institution, Washington, D.C.- in Rapa Nui Journal, Vol. 27, No. 1. Los Osos CA, USA, pp. 37-61

Kersten, Thomas & Lidstaedt, Maren (2012): Generierung von 3D-Punktwolken durch kamera-basierte low-cost Systeme.- Workflow und praktische Beispiele. Terrestrisches Laserscanning 2012 (TLS2012), Schriftenreihe des DVW, Band 69, Beiträge zum 121. DVW-Seminar am 13. und 14. Dezember 2012 in Fulda, Wißner-Verlag, Augsburg, pp. 25-46

Landis, Hayden (2002): Production-Ready Global Illumination. Course 16 notes, SIGGRAPH 2002 (http://renderman.pixar.com/view/production-ready-global-illumination)

Lavachery, Henri (1939): Les Pétroglyphes de l'Ile de Pâques.- De Sikkel, Anvers

Lee, Georgia (1986): Easter Island Rock Art: Ideological Symbols as Evidence of

Socio-Political Change.- Unpublished Ph.D. Dissertation, University of California, Los Angeles
Lee, Georgia (1992): The Rock Art of Easter Island: Symbols of Power, Prayers to the Gods. Monumenta Archaeologica 17.- The Institute of Archaeology, University of California, Los Angeles
Lee, Georgia & Ika, Keremo (1999): Petroglyphs and Legends of Rapa Nui.- in Rapa Nui Journal, Vol. 13, No. 3. Los Osos CA, USA. pp. 114-118
Lee, Georgia & Horley, Paul (2013): The Paintings of Ana Kai Tangata Cave, Easter Island (Rapa Nui).- in Rapa Nui Journal, Vol. 27, No. 2. Los Osos CA, USA. pp. 11-32
Lee, Georgia & Stasack, Edward (1999): Spirit of Place: Petroglyphs of Hawai'i.- Easter Island Foundation, Los Osos
Lipo, Carl P. & Hunt, Terry L. (2009): Rapa Nui *Pukao.* Geo-referenced image database (http://www.terevaka.net/dc/databases/lipo_and_hunt_2009/Pukao.html)
Martinsson-Wallin, Helene & Wallin, Paul. (2000): Ahu and Settlement: Archaeological Excavations at 'Anakena and La Pérouse.- in Easter Island Archaeology: Research on Early Rapanui Culture, Stevenson, Christopher M. & Ayres, William S., Eds.- Easter Island Foundation, Los Osos. pp. 27-43.
Mellén Blanco, Francisco (1990): Cartografía Histórica de la Isla de Pascua en el Siglo XVIII, Acompañada de Algunos Datos Etnológicos y Arqueológicos.- in State and Perspectives of Scientific Research in Easter Island Culture, Esen-Baur, Heide-Margaret, Ed.- Courier Forschungsinstitut Senckenberg, Frankfurt am Main, pp. 123-137
Métraux, Alfred (1940): Ethnology of Easter Island. Bernice P. Bishop Museum Bulletin 160.- Bishop Museum Press, Honolulu
Milet-Mureau, M.L.A., Ed. (1797): Voyage de La Pérouse Autour du Monde. 4 Volumes and Atlas.- L'Imprimerie de la République, Paris
Milet Mureau, M.L.A., Ed. (1798): The Voyage of La Pérouse Round the World, in the Years 1785, 1786, 1787, and 1788, with the Nautical Tables. 2 Volumes.- John Stockdale, Piccadilly, London
Miklouho-Maclay, Nikolai N. (1872): Ueber die "Kohau rogo rogo" oder die Holztafeln von Rapa-Nui.- in Zeitschrift der Gesellschaft für Erdkunde zu Berlin, Vol. 7. Berlin, Germany, pp. 79-81
Mulloy, William (1961): The Ceremonial Center of Vinapu.- in Archaeology of Easter Island: Reports of the Norwegian Archaeological Expedition to Easter Island and East Pacific, Heyerdahl, Thor & Ferdon, Edwin Jr., Eds., Monograph of the School of American Research and the Museum of New Mexico, Nr. 24, Vol. 1.- New Mexico, Santa Fe, pp. 93-180.
Mulloy, William (1997): The Easter Island Bulletins of William Mulloy.- World Monuments Fund and Easter Island Foundation, New York
Mulloy, William & Figueroa, Gonzalo (1978): The A Kivi – Vai Teka Complex and its Relationship to Easter Island Architectural Prehistory. Asian and Pacific Archaeology Studies No. 8.- The Social Science Research Institute, University

of Hawaii, Honolulu
Mulrooney, Mara; Ladefoged, Thegn; Stevenson, Christopher M. & Haoa, Sonia (2009): The Myth of A.D. 1680: New Evidence from Hanga Ho'onu, Rapa Nui (Easter Island).- in Rapa Nui Journal, Vol. 23. Los Osos CA, USA. pp. 94-105
Orliac, Catherine & Orliac, Michel (1995): Easter Island, Mystery of the Stone Giants.- Harry N. Abrams, New York
Palmer, John Linton (1870): Visit to Easter Island, or Rapa Nui, in 1868.- in Journal of the Royal Geographical Society of London, Vol. 40. London, UK. pp. 167-181
Palmer, John Linton (1875): Davis or Easter Island.- in Proceedings of the Literary and Philosophical Society of Liverpool, Vol. 29. Liverpool, UK. pp. 275-297
Routledge, Katherine (1919): The Mystery of Easter Island.- Hazell, Watson and Viney, London
Shepardson, Britton (2009): Moai of Rapa Nui (Easter Island, Chile). Geo-referenced image database (http://www.terevaka.net/dc/databases/shepardson_2009/Moai_pt1.html)
Smith, Carlyle S. (1961): A Temporal Sequence Derived from Certain Ahu.- in Archaeology of Easter Island: Reports of the Norwegian Archaeological Expedition to Easter Island and East Pacific, Heyerdahl, Thor & Ferdon, Edwin Jr., Eds., Monograph of the School of American Research and the Museum of New Mexico, Number 24, Vol. 1.- New Mexico, Santa Fe, pp. 181-219.
Steiner, Hartwig-E. (2008): Die Jungfrauen-Höhle auf der Osterinsel "Ana O Keke" auf Poike / Rapa Nui, Polynesien.- in Almogaren, Vol. 39. Wien, Österreich, pp. 253-320
Stevenson, Christopher & Haoa, Sonia (1998): Prehistoric Gardening Systems and Agricultural Intensification in the La Pérouse Area of Easter Island.- in Easter Island in Pacific Context: South Seas Symposium, Proceedings of the Fourth International Conference on Easter Island and East Polynesia. Stevenson, Christopher; Lee, Georgia & Morin, Francis, Eds.- Easter Island Foundation, Los Osos. pp. 205-213
Thomson, William J. (1891): Te Pito te Henua or Easter Island.- in Report of the U.S. National Museum for the Year Ending June 30, 1889.- U.S. Government Printing Office, Washington. pp. 447-552
Van Tilburg, Jo Anne (1994): Easter Island: Archaeology, Ecology and Culture.- British Museum Press, London
Van Tilburg, Jo Anne & Arévalo Pakarati, Cristino (2012): Rano Raraku: a brief overview of six seasons of excavations, three seasons of conservation interventions, and a heritage management program, 2010-2012.- in Rapa Nui Journal, Vol. 26, No. 2. Los Osos CA, USA. pp. 75-81
Van Tilburg, Jo Anne & Lee, Georgia (1987): Symbolic Stratigraphy: Rock Art and the Monolithic Statues of Easter Island.- in World Archaeology, Vol. 19, No. 2. pp. 133-149.

Figs. 2-31 →

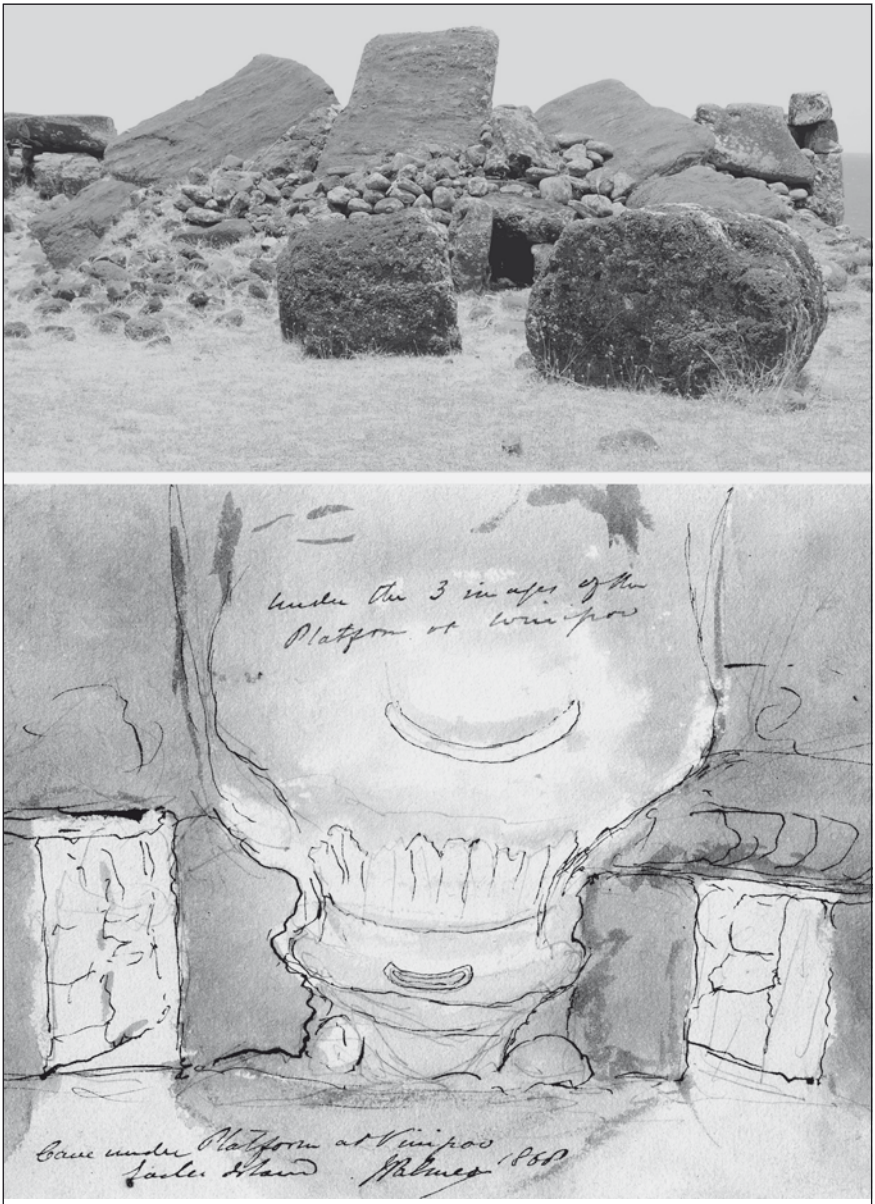


Figure 2. Ahu Tahiri (Ahu Vinapū 1). Top: shelter constructed under the toppled statues. Bottom: 1868 watercolour by J.L. Palmer (image T02995 courtesy of the Royal Geographical Society with IBG) showing crescent-shaped canoe painted on the *moai* 02-210-02.

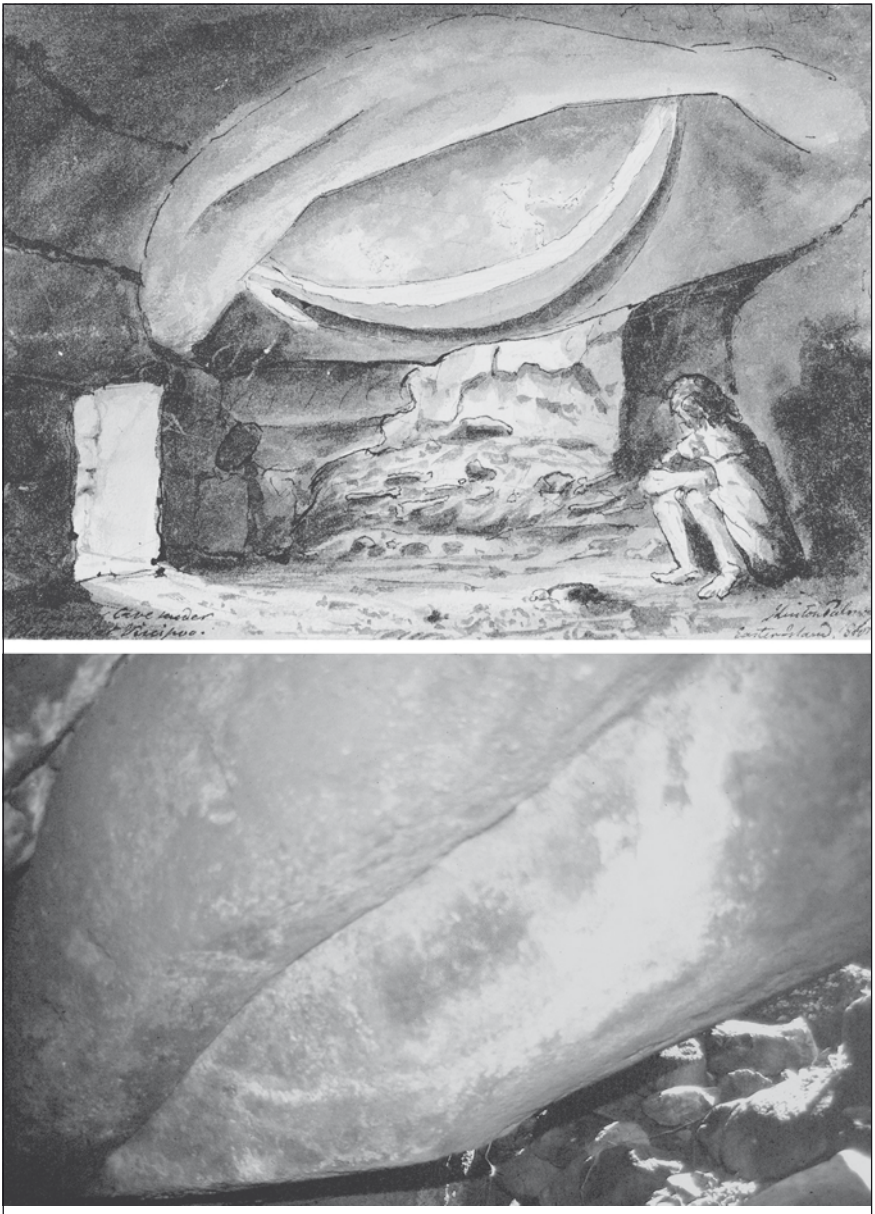


Figure 3. Ahu Tahiri (Ahu Vinapū 1). Top: 1868 watercolour by J.L. Palmer (image T02998 courtesy of the Royal Geographical Society with IBG) showing a ship with a white anthropomorph on board. Bottom: modern view of *moai* 02-210-03 (photo D-18.4 by G. Lee, 1986).

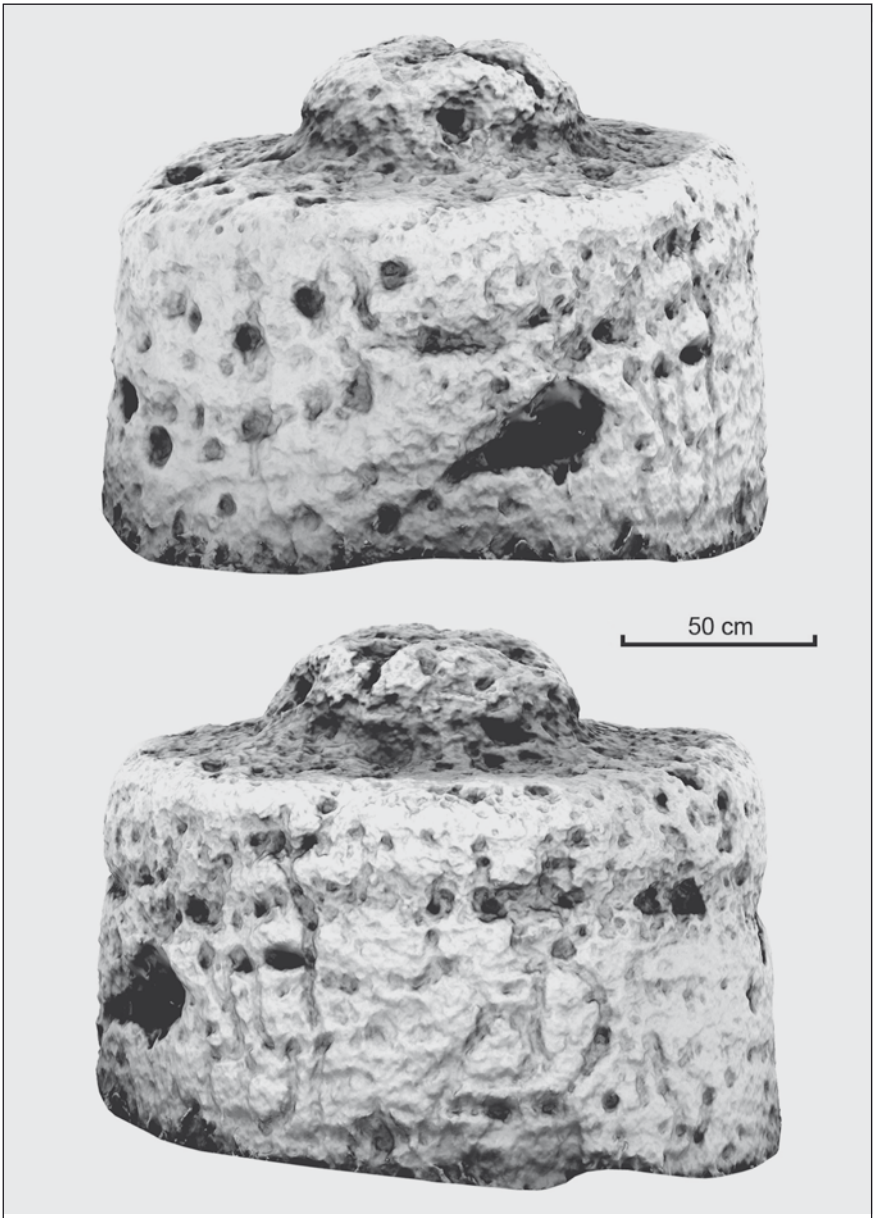


Figure 4. Ahu Vinapū 2. Topknot #5 positioned at the corner of *ahu* ramp, featuring carvings of canoes and a possible phallic symbol.

Figure 5. Ahu Vinapū 2. Top: canoe petroglyph on a fragment of red scoria facia between the *moai* 02-209-05 and 02-209-04. Bottom: topknot #4 associated with a paved area in front of the *ahu*.

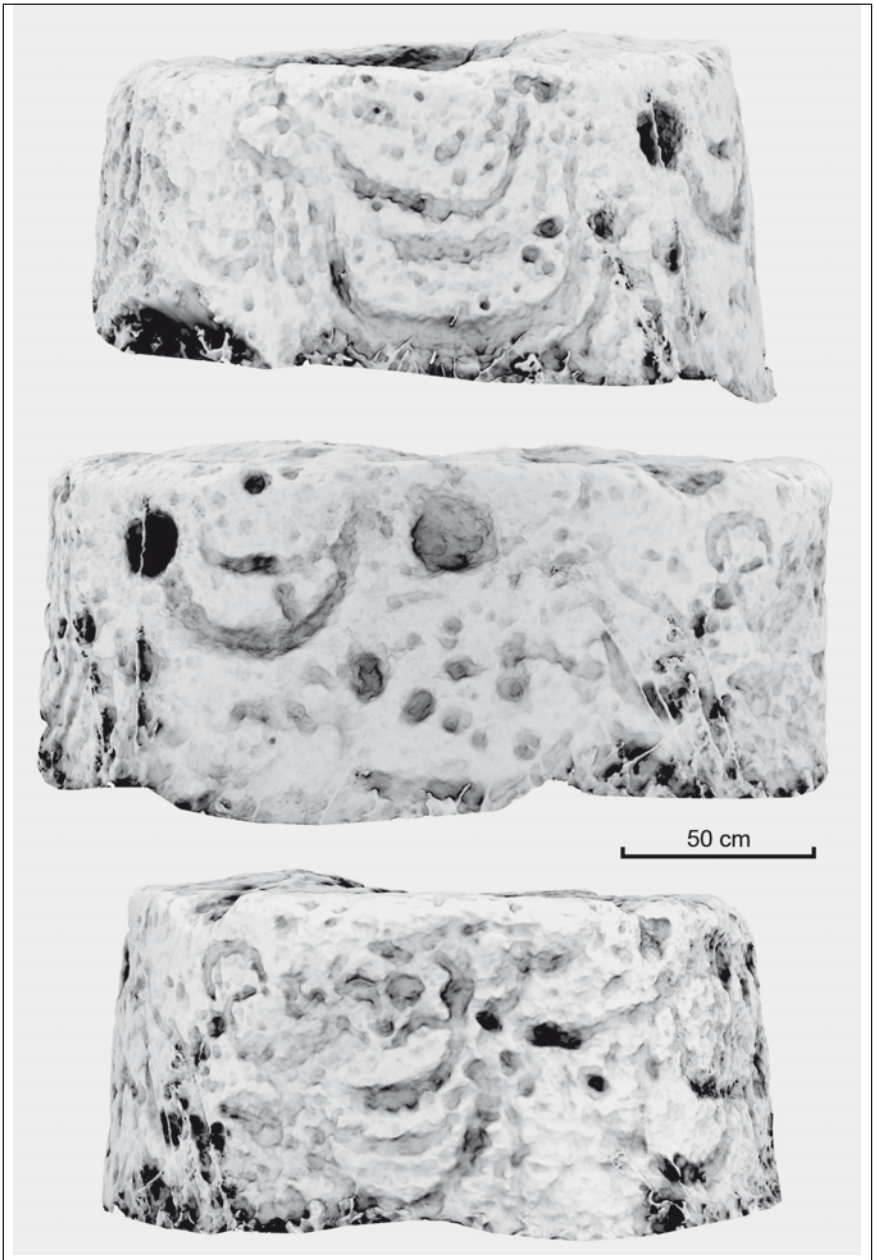


Figure 6. Ahu Vinapū 2. Three principal views of topknot #4 with interlaced canoe carvings.

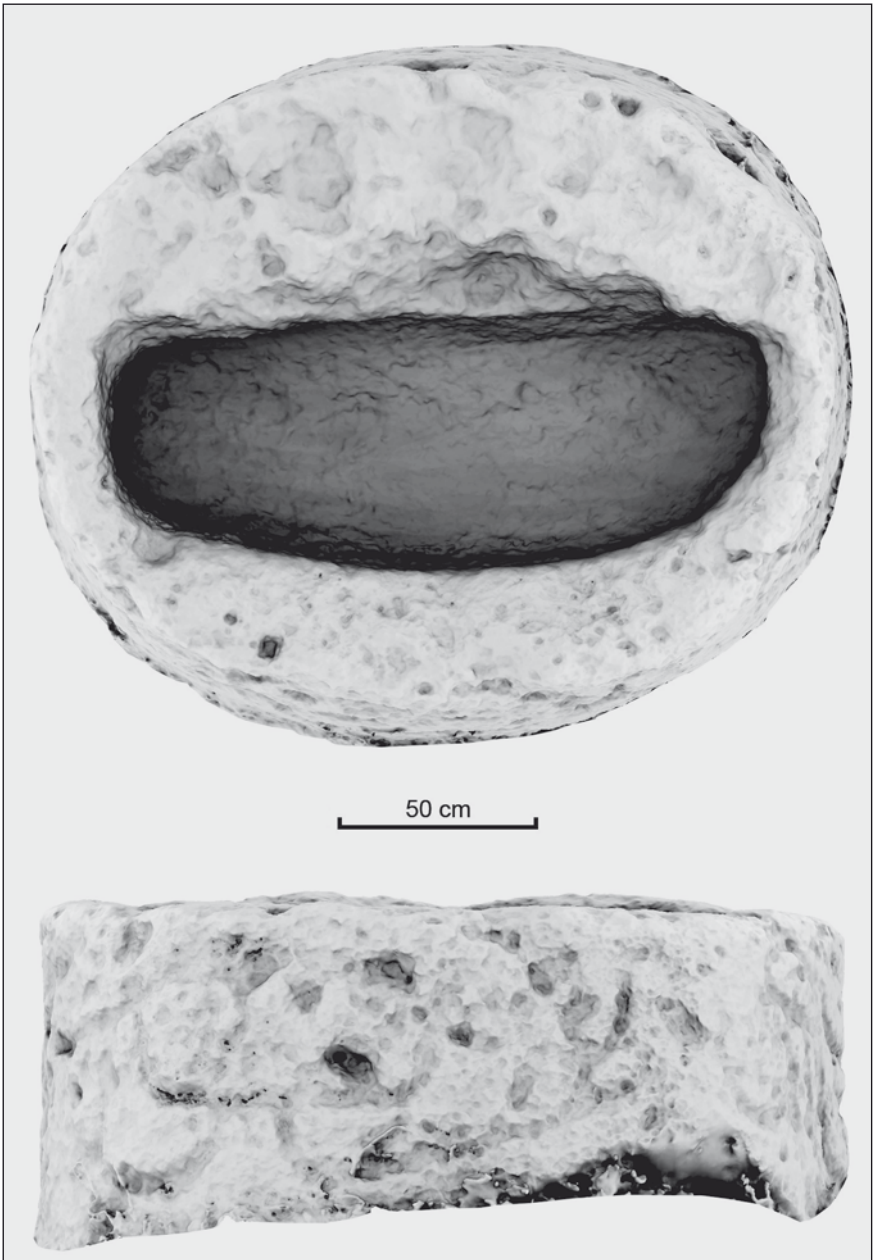


Figure 7. Ahu Vinapū 2. Top view and fourth principal view of the topknot #4.

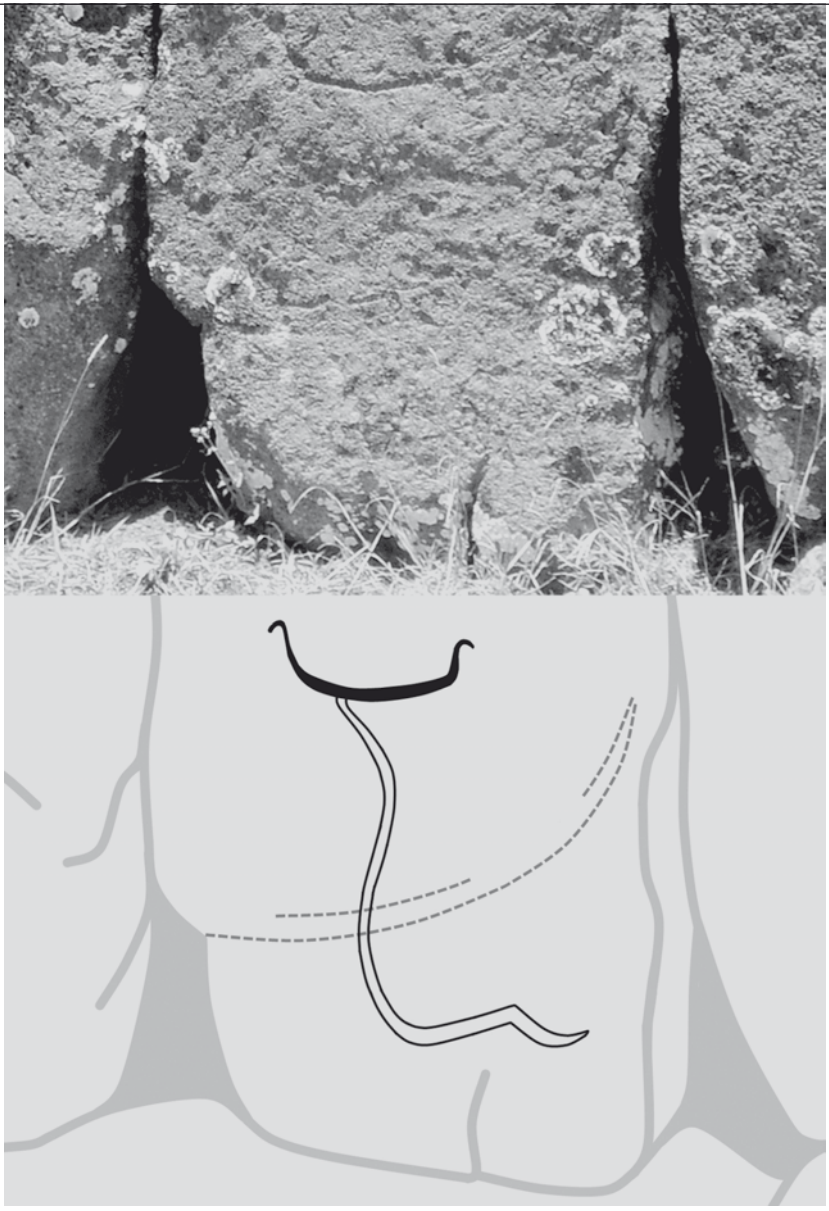


Figure 8. Ahu Vinapū 2. Canoe with a wavy appendage incised on the ninth slab from the right extremity of the sea wall. The tracing was made consulting the historical image (Mulloy 1961: Pl. 12b). A possible canoe design overlooked by Mulloy is shown with a dashed line.

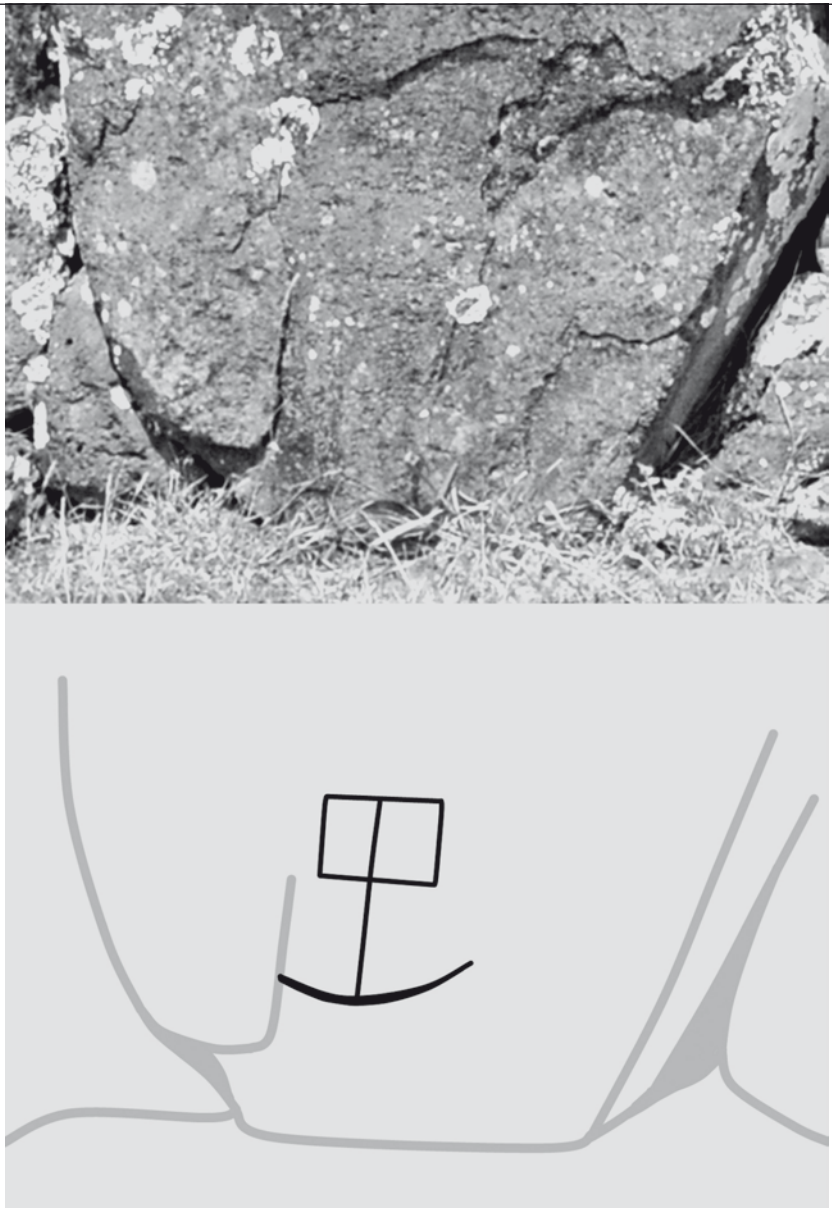


Figure 9. Ahu Vinapū 2. Historic ship with a square sail incised on the second slab from the right extremity of the sea wall. The tracing was made by consulting the historical photograph of the slab taken after the 1955-56 excavations (Mulloy 1961: Pl. 12a).

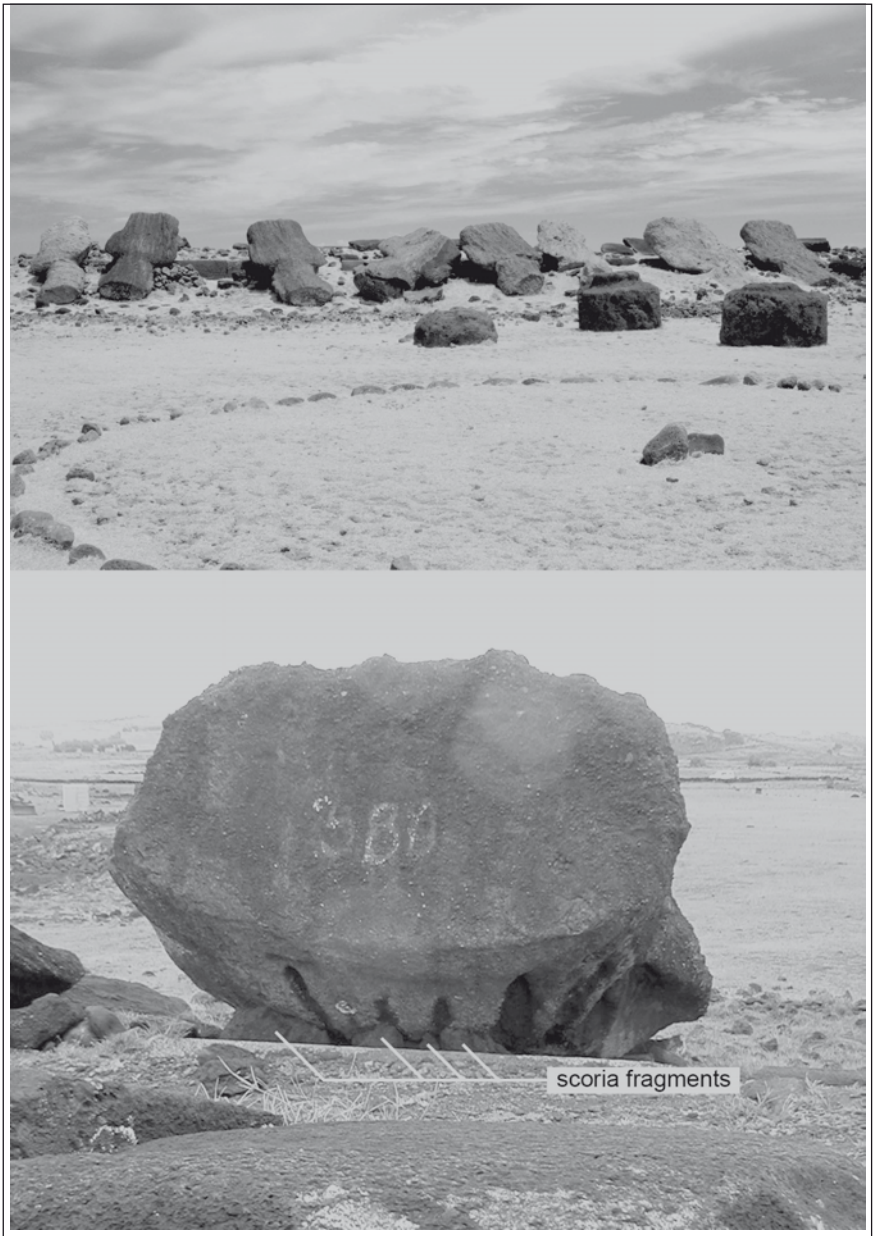


Figure 10. Ahu Hanga Te‘e (Vaihū). Top: landward view showing *paina* circle in the foreground. Bottom: *moai* 06-255-02 with *hami* area mutilated by deep gashes filled with red scoria fragments.

Figure 11. Ahu Hanga Te‘e (Vaihū). Top: view of the carvings exposed over the water surface of topknot #18 (photo D-24.1 by G. Lee, 1986). Bottom: the same topknot placed on dry land.

Figure 12. Ahu Akahanga. Top: general landward view. Centre and bottom: location of red scoria facia slabs embellished with secondary carvings.

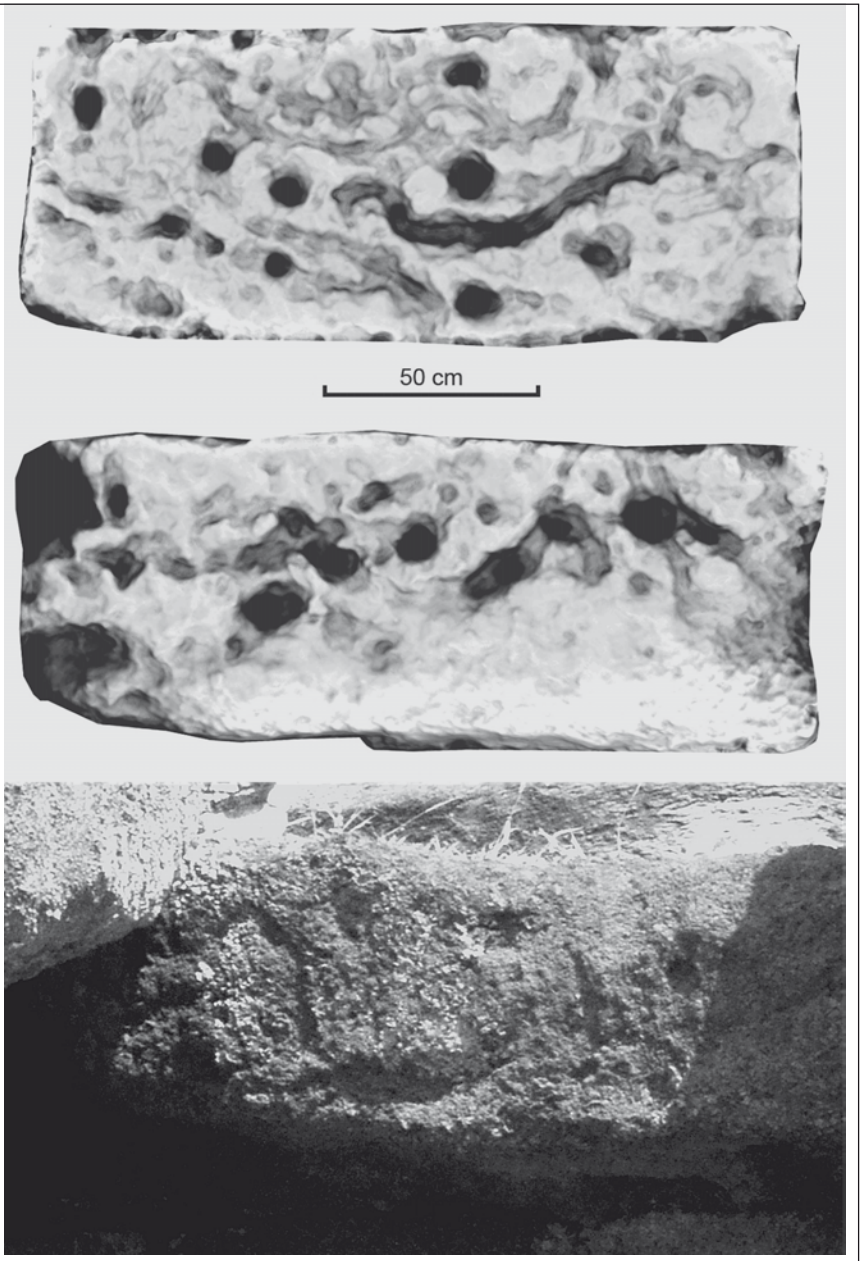


Figure 13. Ahu Akahanga. Slabs G, F, and E (from top to bottom) featuring cupules and numerous canoe motifs.

Figure 14. Ahu Akahanga. The facia slab D with a "marine creature". Top: as documented by Ayasse (Thomson 1891: Fig.19, courtesy of National Anthropological Archives, Smithsonian Institution). Middle: photographic record, 2013. Bottom: 3D model showing that the complex motif includes several canoe carvings.

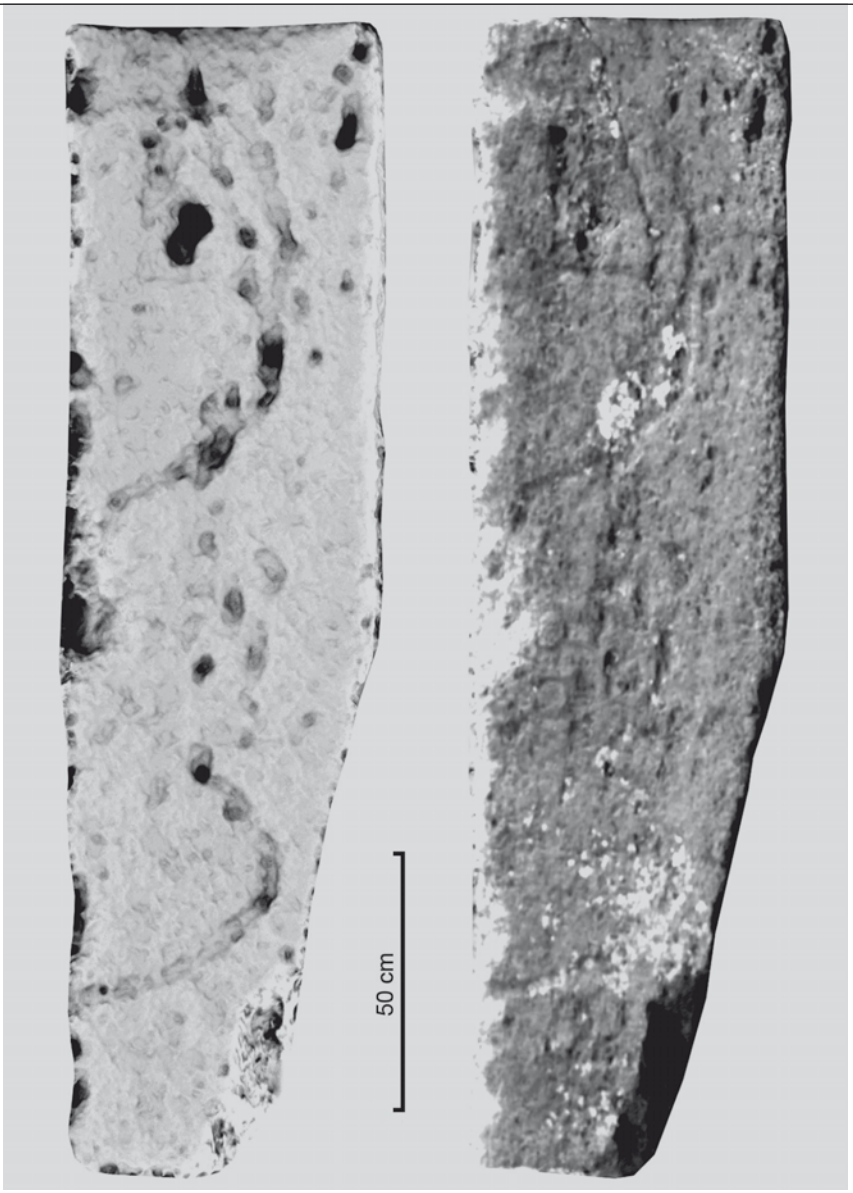


Figure 15. Ahu Akahanga. The facia slab C with two canoes and a face mask. The latter carving, due to the shallowness of its grooves, is almost invisible in the 3D model rendered with ambient occlusion. However, it can be clearly seen in the textured 3D model. The slab is shown sideways to improve the presentation.

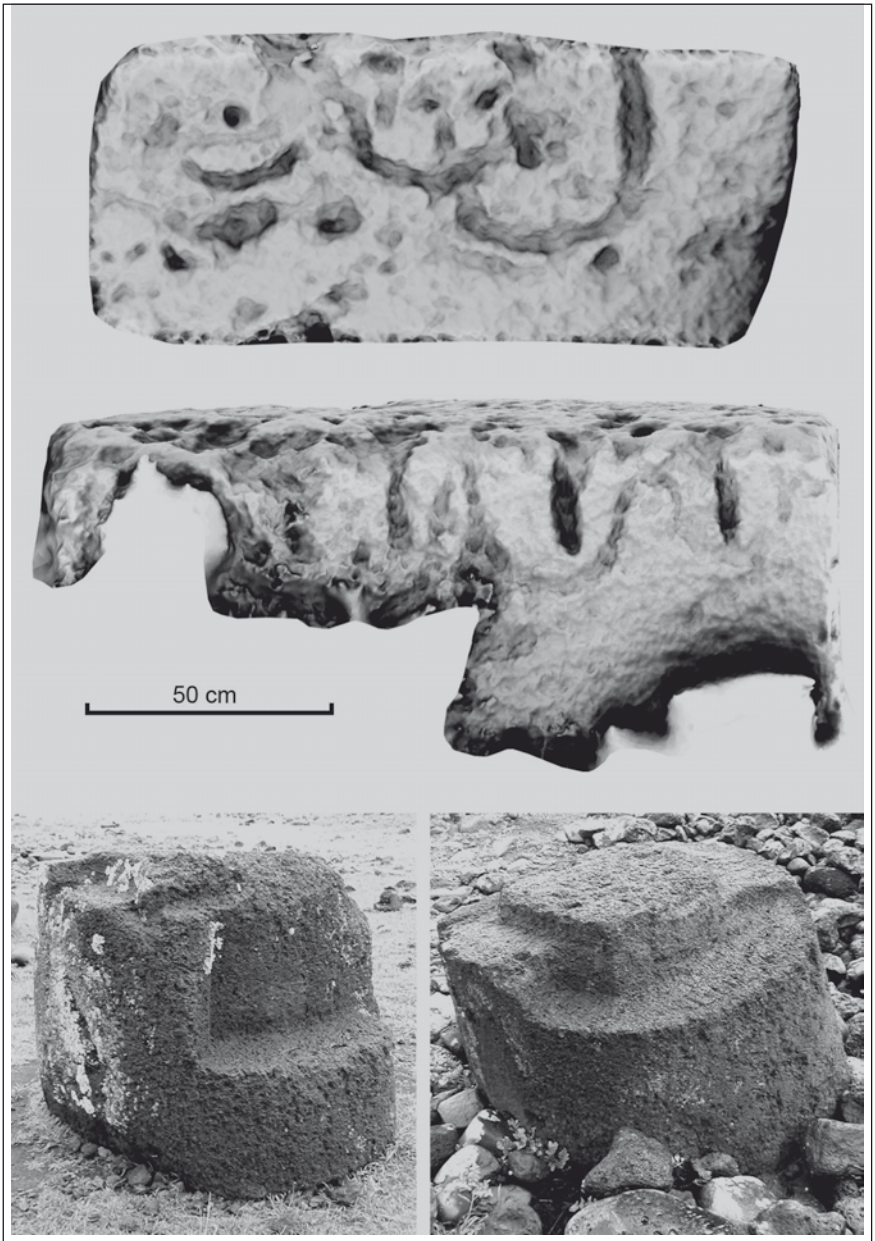


Figure 16. Ahu Akahanga. Top: slabs B and A adorned with interlaced canoe carvings. Bottom: topknots #34 and #38 of Akahanga feature rather complex variations of the basic knobbed shape.

Figure 17. Ahu Akahanga. Top: *Pukao* #36 with carvings of anthropomorph, two-headed frigate bird and a *manutara*. Bottom: similar sign groups on *rongorongo* tablet Tahua.

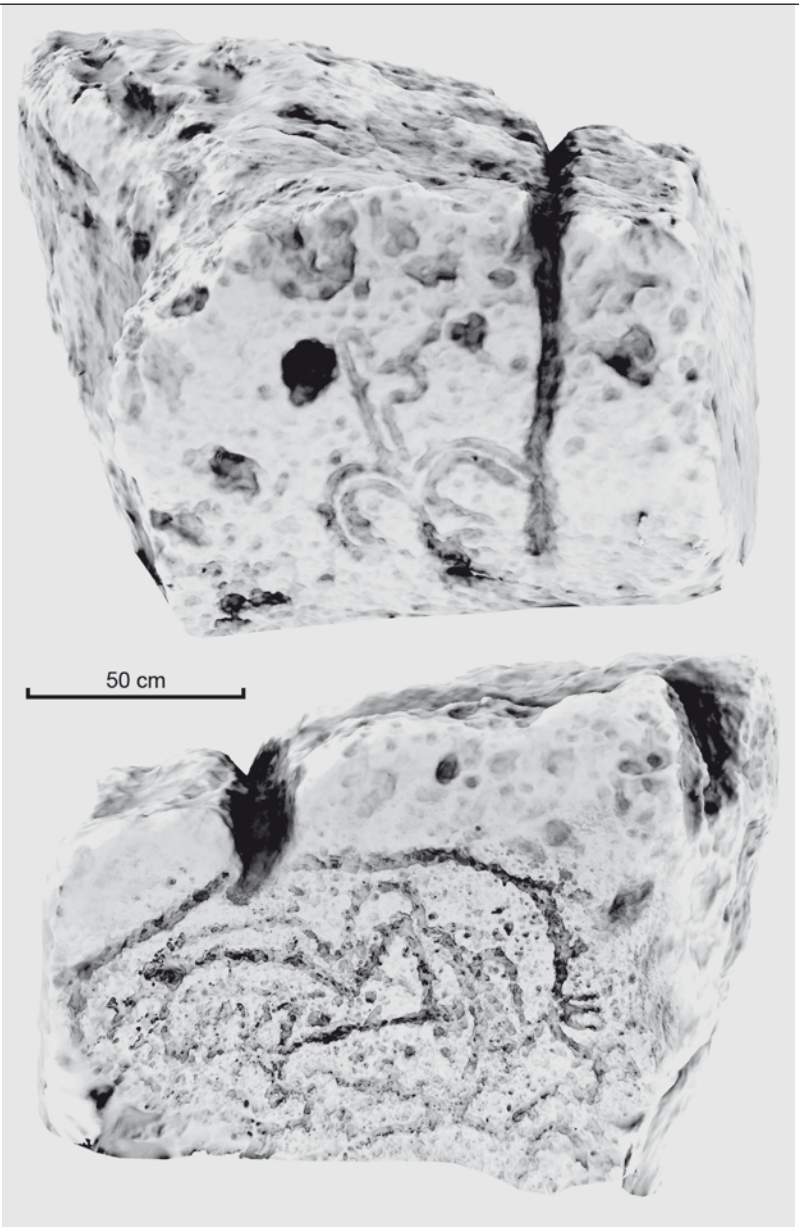


Figure 18. Ahu Akahanga. Two views of topknot #35 with a *manutara* carving on its landward side and a composite motif on its seaward side. Wide dark channels were apparently cut for splitting *pukao* into several parts.

Figure 19. Ahu Akahanga. Top: decomposition of the interlaced carvings on topknot #35 into a bird inside the egg and a supine *moai*. Bottom: topknot #35 in foreground with statue 07-584-01 similar to the petroglyph image lying just beside re.

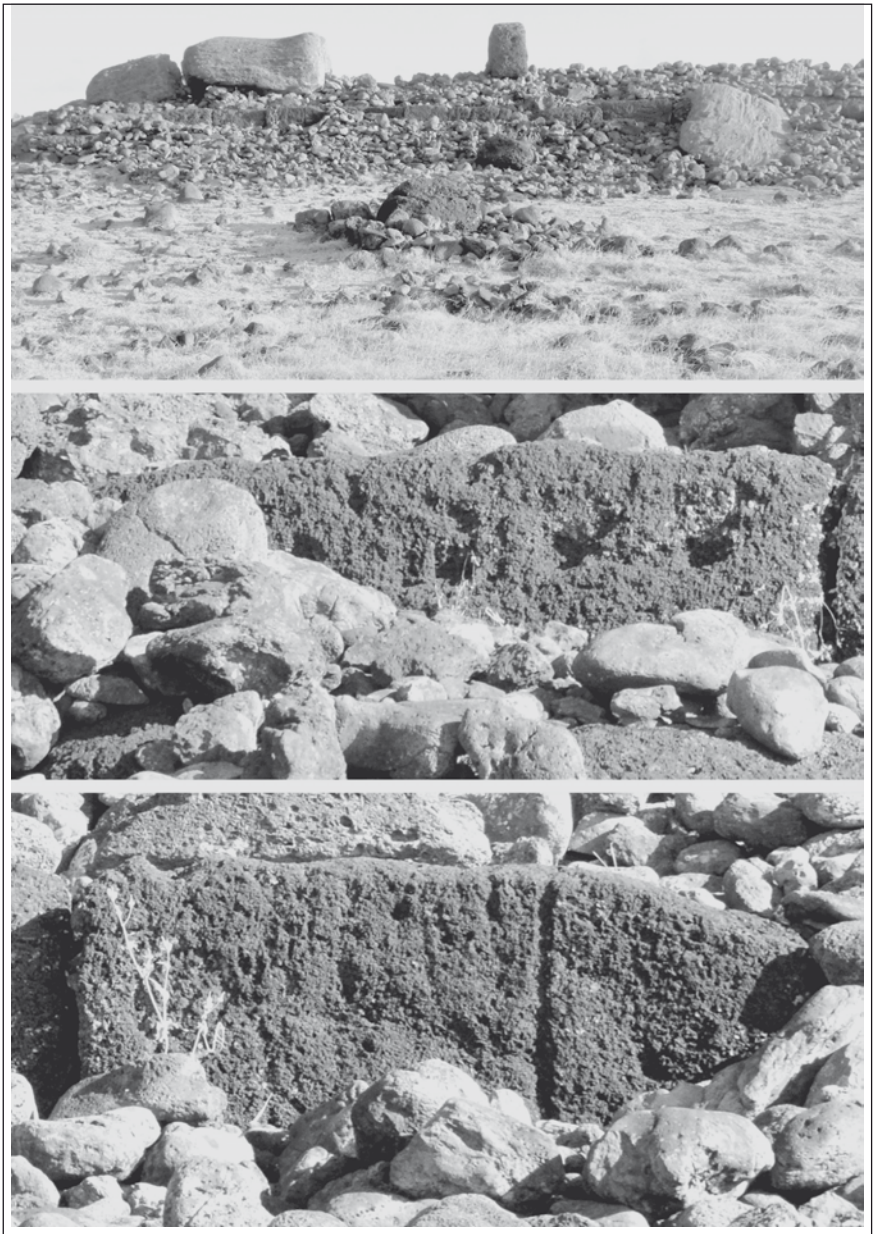


Figure 20. Ahu ‘One Makihi. Top: general view of the *ahu* with red scoria upright #44. Centre and bottom: two facia slabs from left side of the platform feature cupules and canoes.

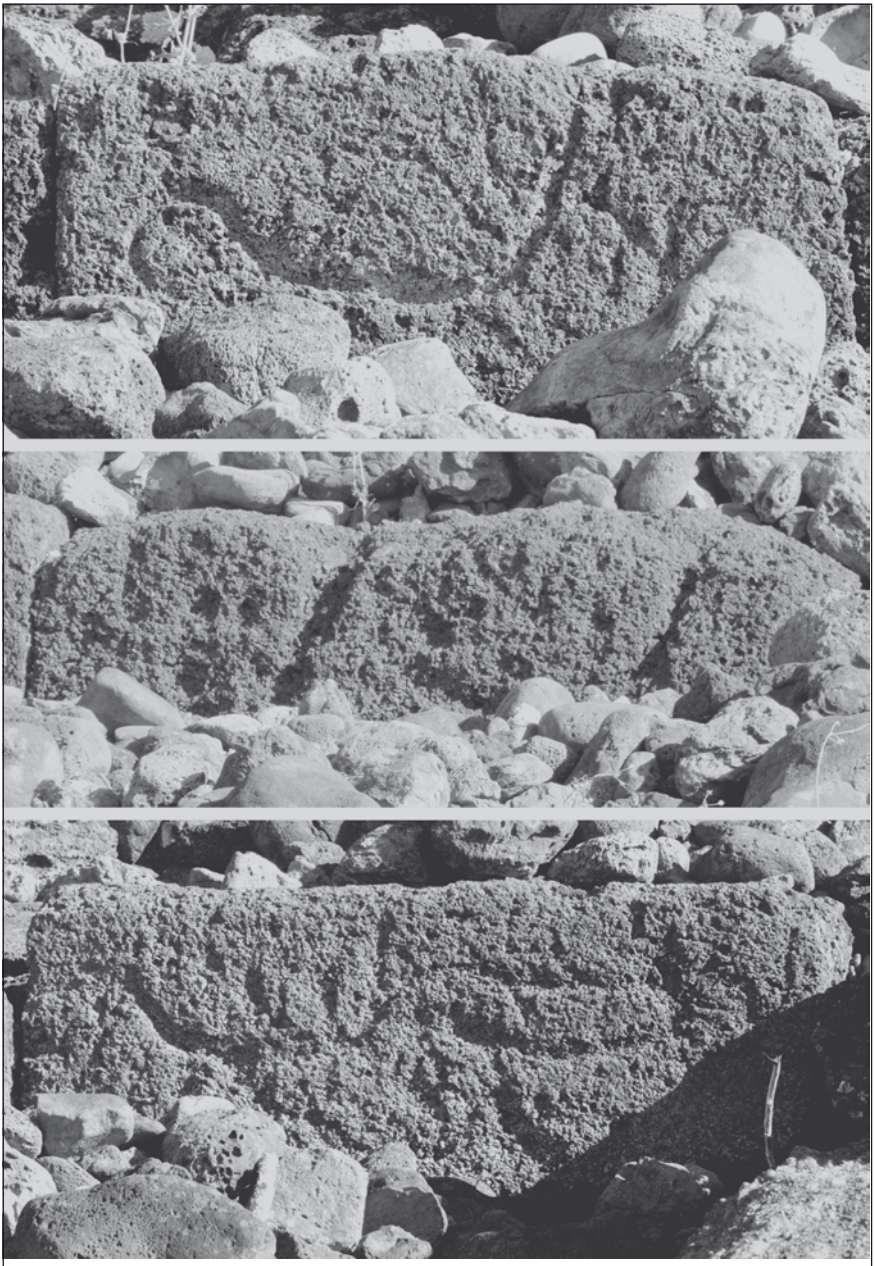


Figure 21. Ahu ‘One Makihi. Three facia slabs from the right side of the platform are profusely adorned with canoe carvings.

Figure 22. Hanga Tu‘u Hata. Historical ships incised on a vertical rock panel (photo D-27-14 by M. Oliver, 1986).

Figure 23. Rano Raraku. Historical ship as secondary petroglyph on *moai* RR-049.

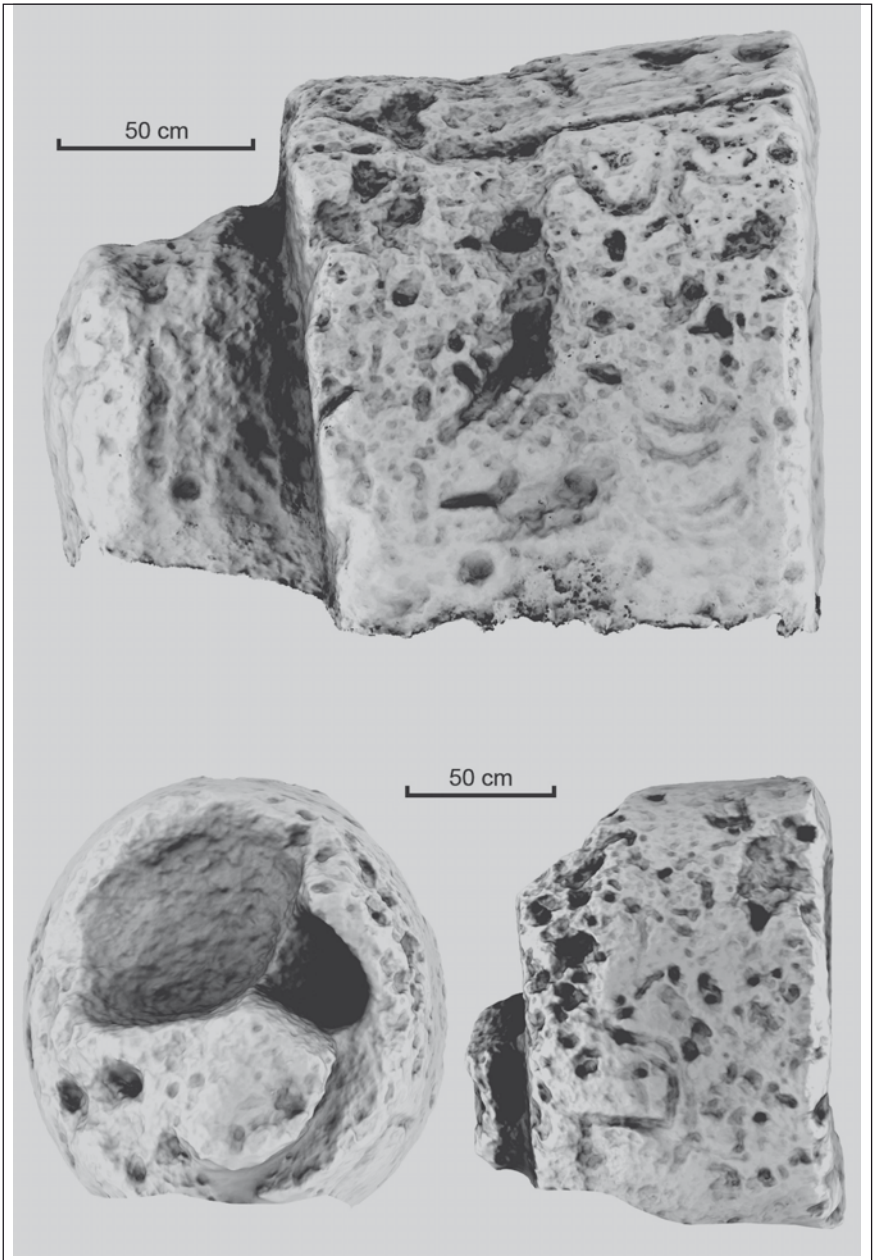


Figure 24. Ahu Heki‘i. Topknots adorned with multiple canoe carvings. Top: *pukao* #61. Bottom: *pukao* #59.

Figure 25. Ahu Heki‘i. Top: boat carvings on the underside of *pukao* #57, which was rolled after the carving was done. Bottom: boat carved on the flank of *moai* 31-999-07, half-buried under the mantle of stones.

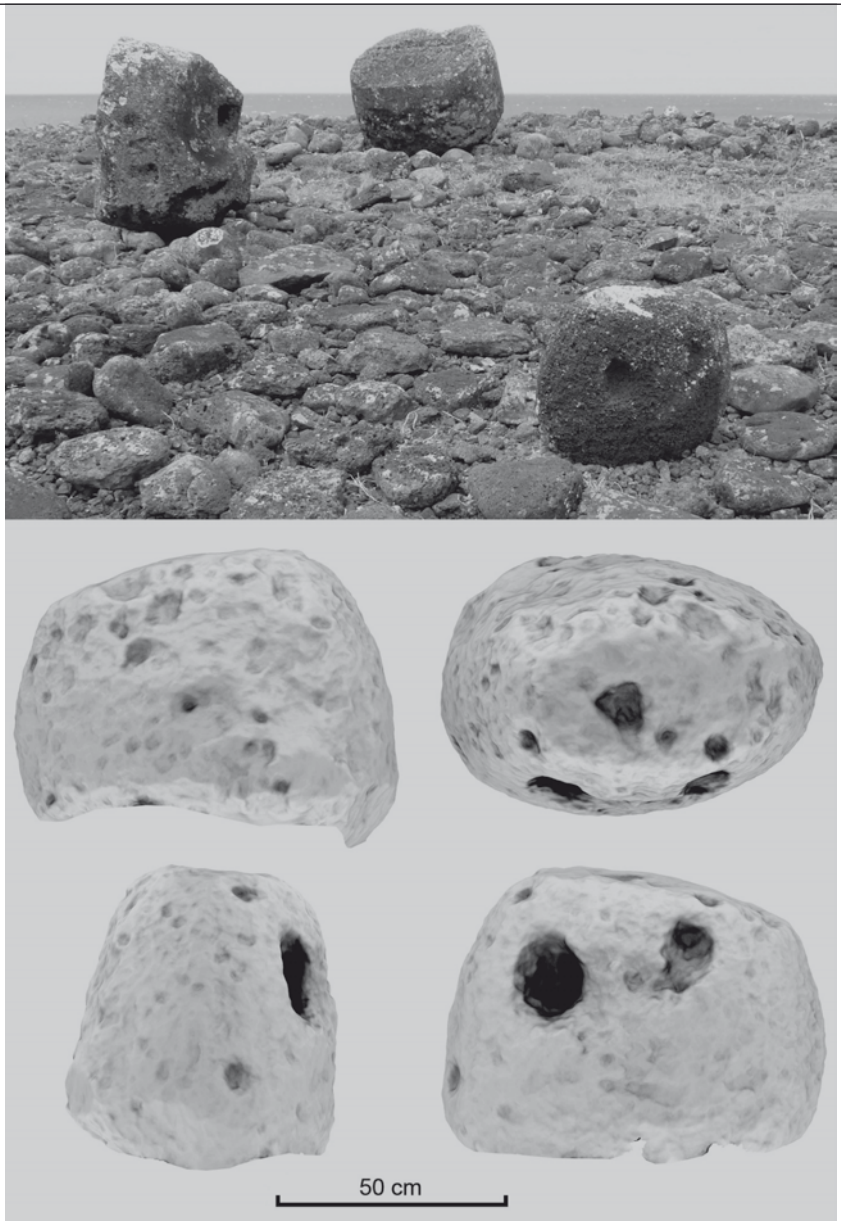


Figure 26. Ahu Heki‘i. Red scoria upright #58 with two deep cupules possibly representing eyes on its landward side. The seaward side (upper left view of 3D model) is smooth.

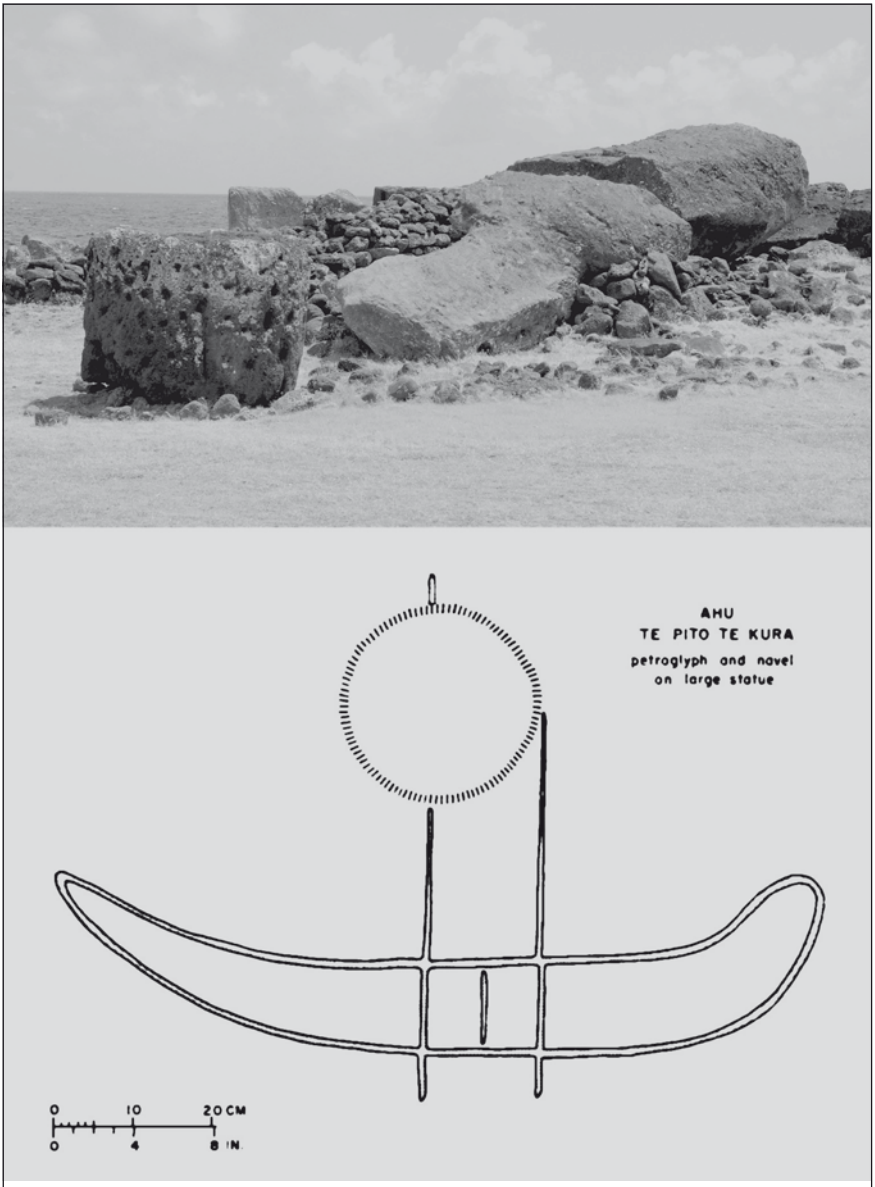


Figure 27. Ahu Te Pito Kura. Top: *moai* Paro 30-997-01 and topknot #73 covered with cupules. Bottom: boat carved on statue's abdomen (Smith 1961: Fig.57, courtesy of the Kon-Tiki Museum).

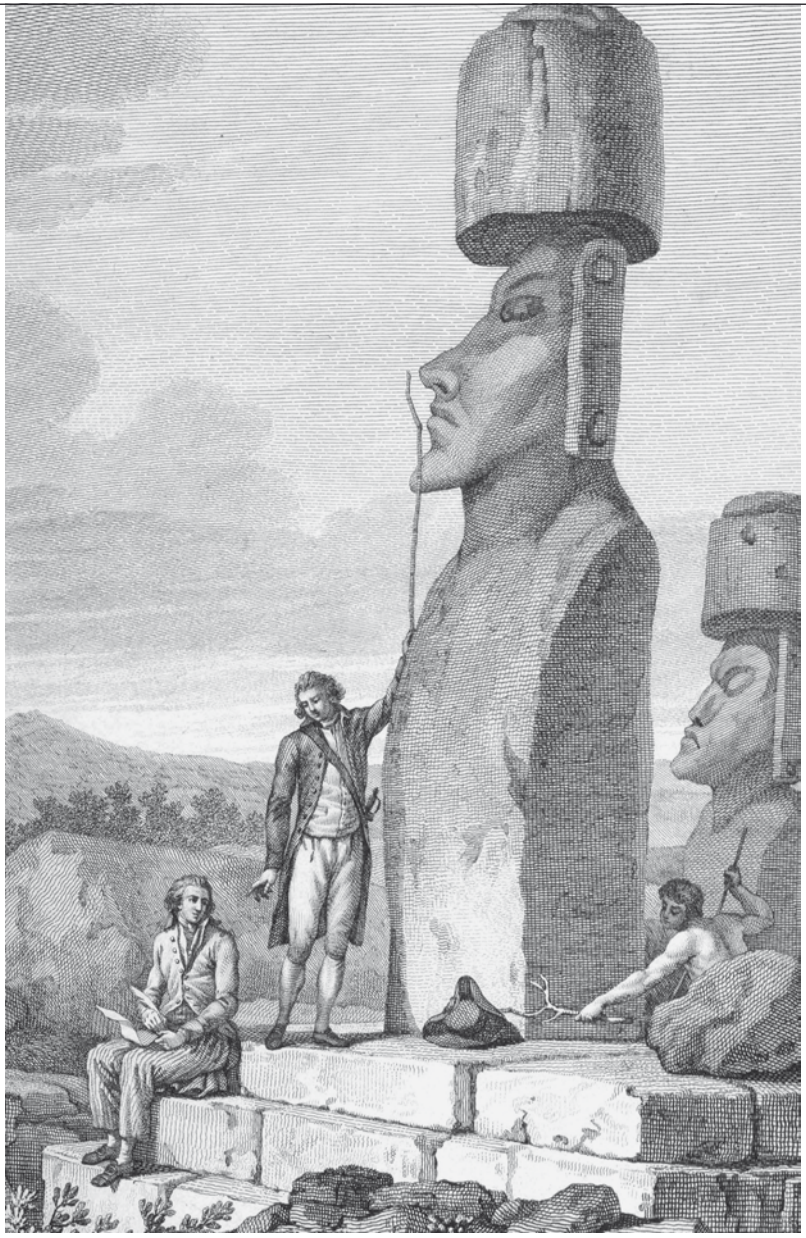


Figure 28. Close-up of Godefroy's etching (Milet-Mureau 1797: Pl. 11) showing two *moai* standing on a platform. The foreground statue is documented with eye inlays installed.

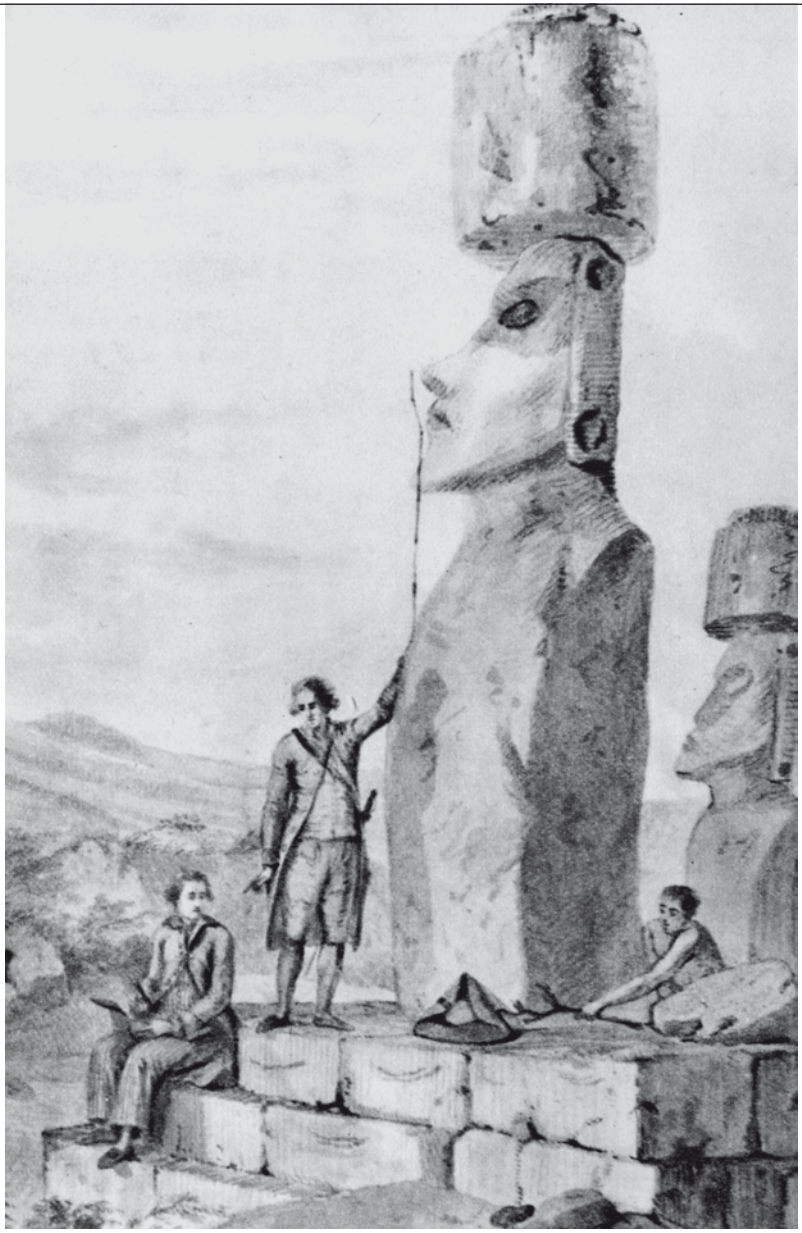


Figure 29. Close-up of the drawing by Duché de Vancy (Chauvet 1935: Pl. 3, Fig. 5) on which Godefroy's etching was based. Note that the *ahu* facia slabs are adorned with canoe carvings.

Figure 30. *Moai* of Ahu Tongariki with round sockets carved in the lower part of their earlobes, possibly intended to receive decorative inlays.

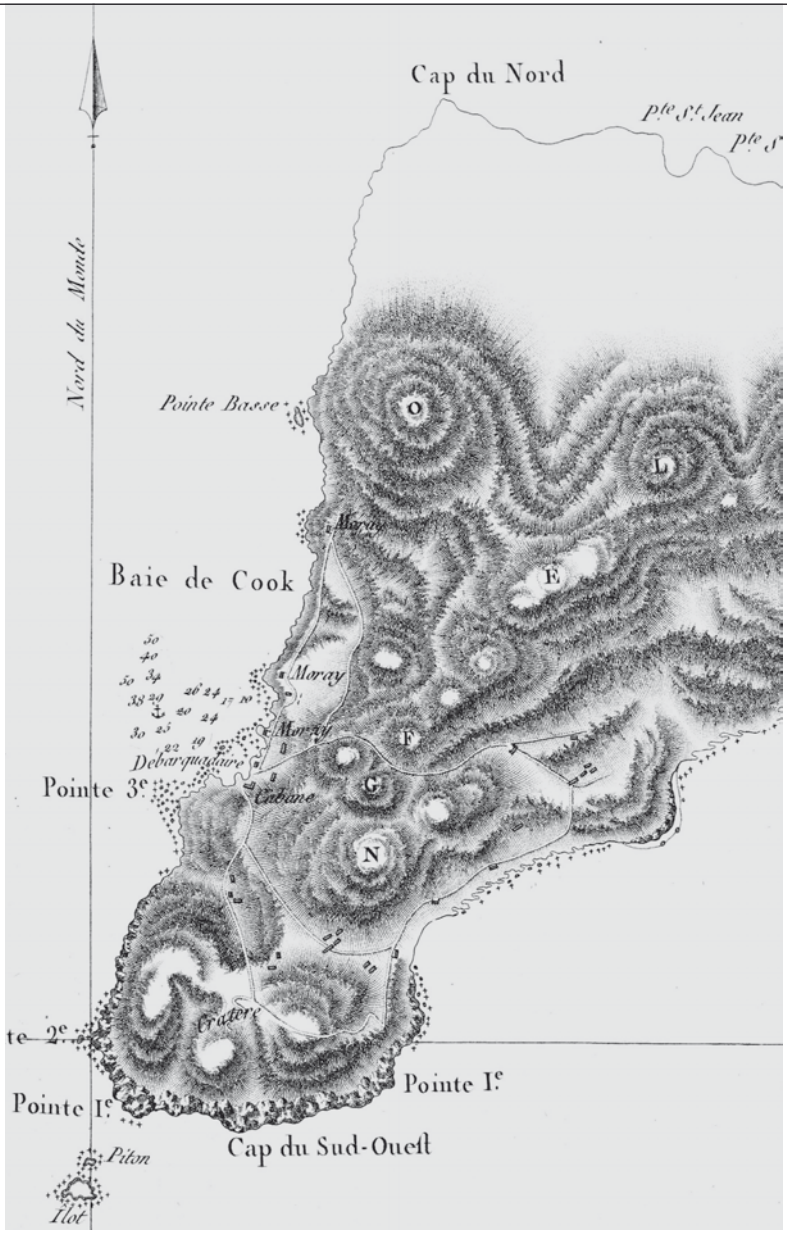


Figure 31. Map from Atlas du Voyage de La Pérouse (Milet-Mureau 1797: Pl. 10) showing the route of the reconnaissance party led by De Langle and the *ahu* visited.