archival work reconstructing the history of Tupaia's maps, we chose to focus on the authors' *avatea* system. It seemed at first reading a seductive hypothesis and it challenges our own work about island compasses, but the more we struggled with it, trying to decipher their analysis, the more dubious we became. Too many questions remain unresolved, such as why were the islands closest to Tahiti, and therefore the ones that should be well known to Tupaia, the northern Tuāmotus and the Marquesas,[8] not placed on the map using the *avatea* system? One could, like the authors, argue that the ship's officers directed the relative placement of the Tuāmotus on the chart (p. 68), but in that case it is surprising that these same islands (most of which were unknown to the Europeans) function quite well with the island compass system.[9] Why do so many of the new identifications relate to small, uninhabited atolls and a priori of little use for navigation, such as Oeno, Ducie, Rose atoll, Uea (close to Rotuma), Manuae atoll, Motu One? Tupaia would not have agreed with their identifications. He described the first four as inhabited and large, specifying that they abound 'with the same Provisions and Commodities' as Tahiti (p. 19, fig. 6, 47).

ANNE DI PIAZZA
Aix Marseille Université, CNRS, EHESS, CREDO
anne.dipiazza@pacific-credo.fr

ERIK PEARTHREE
Independent Scholar

Authors' Response: The Making of Tupaia's Map Revisited

We are sincerely thankful to the *Journal of Pacific History* for hosting a discussion of our research on Tupaia's Map and for inviting responses to our findings from colleagues on whose writings we have drawn extensively in our research and to whose work we remain deeply indebted.

In 'Hidden Hazards: Reconstructing Tupaia's Chart', Anne Salmond emphasizes the categorical epistemic difference between the knowledge traditions of European and Polynesian worldmaking and their concomitant strategies of wayfinding. The available colonial archive of the *Endeavour*'s voyage, she argues, is one-sided, full of gaps, and bound to be replete with misunderstandings. On these grounds, she cautions against the confidence with which we have drawn conclusions in our extended argument, such as about the voyaging paths represented on Tupaia's Map, or, more fundamentally, about Tupaia's lost original drafts.

In 'Does the *Avatea* System Offer a New Key for the Reading of Tupaia's Maps?', Anne di Piazza and Erik Pearthree take a different angle of critique. Whilst placing a lot of confidence in the stability of the colonial archive, they doubt the validity of our analysis of what we have called the *avatea* system, from the distinct perspective of practical Oceanic wayfinding as still performed, for example, by Micronesian master navigators. Not only is the concept of *avatea* – the orientation toward the sun at noontime that provides a northern bearing in the Southern Hemisphere – inconsistent with recorded Oceanic voyaging practices; what is worse, the angles for island-to-island voyaging indicated by the *avatea* system are overall too wide to stand the test of practical island finding.

[8] Finney, 'Nautical Cartography', fig. 13.3.

[9] Anne Di Piazza and Erik Pearthree, 'A New Reading of Tupaia's Chart', *Journal of the Polynesian Society* 16, no. 3 (2007): figs. 4, 5.

Atholl Anderson in turn takes no issue with our reading of the *avatea* system, which he finds convincing (and even uses to propose alternative interpretations of voyaging paths on the map). In 'Alternative Perspectives on Tuapia's Mapmaking', he rather perceives an overreliance on ethnographic research and insights gained from experimental voyaging, and challenges our seeming disregard of more conservative historical inferences on ancestral voyaging technologies and capacities, as well as of archaeological evidence. Such evidence, argues Anderson, sheds doubt on the existence of sustained long-distance interaction spheres, especially for the easternmost and northern extensions of Polynesian voyaging. It is on these grounds that he challenges in particular our identifications of O'ahu in Hawai'i on Tupaia's Map, as well as of the Pitcairn group and Rapa Nui (identifications that di Piazza and Pearthree also call into question).

David Turnbull, finally, like Anne Salmond, emphasizes the radical epistemic divide between the two knowledge traditions which find simultaneous expression in Tupaia's Map. In 'Eckstein and Schwarz's Translation of Tupaia's Chart: The Rosetta Stone of Polynesian Navigation?', however, he foregrounds and further elucidates the mutual efforts of translation (linguistic, cultural, epistemic) around the grand cabin table of the *Endeavour*. Unlike Salmond, Turnbull believes that our own efforts to 'translate' these historical translations are based on 'good evidence, and a deep awareness of how difficult it is to understand even one's own ontology and its inconsistencies'; and unlike di Piazza and Pearthree, he recognizes *avatea* as a key 'cartographic translation device'. Turnbull closes with intriguing questions about what the various dimensions of translation might have to offer for a better understanding of the past and futures of Oceanic voyaging.

In our response to the four commentators, we shall focus on the critiques of the first three in particular. We are unable, for reasons of space, to address all concerns that have been raised, but concentrate on the challenges that we think are the most fundamental and important. Their questions provide us with an opportunity to explain in more detail these crucial aspects of our argument and to supplement our points with further evidence. We begin with the intervention by Anne Salmond.

Hidden Hazards: Reconstructing Tupaia's Map

We agree with Anne Salmond that there is a danger in projecting a modern sense of self and the world onto the 18th century in general, and onto Tahitian worldings in particular. As European scholars not based in the region, we strive to emulate the kind of respect and dedication, paired with meticulous historical research modelled by her and other Pacific scholars. We had hoped that our paper does indeed signal, in several instances, our awareness of the linguistic, epistemological and surely also ontological 'differences between Tupaia and his *Endeavour* shipmates', and the prevailing potential for miscommunication.[1] Salmond's passionate reminder that 'we have to deduce these processes from fragmentary and partial information and from a great (temporal and cultural) distance' resonates strongly with our own sense of the material – but should our knowing about

[1] Miscommunication is indeed evident from the earliest stages of encounter, documented for instance in Molyneux's listing of islands that Tupaia had shared with him already in Tahiti and which is so important for our argument. Unlike di Piazza and Pearthree, who quote Molyneux's headings in the list as an unmediated trace of what Tupaia would have or 'would not have' said, we foreground how unreliable Molyneux's commentary actually is (most islands in the third section are *not* Tuamotuan islands the *Endeavour* had passed; islands in the second section only partly range 'East' from Tahiti; most of the islands in the fourth section are actually quite small rather than 'pretty large', etc. Compare Robert Molyneux, 'Master's Log', 26 August 1768–20 October 1769, National Archives Kew, London, Adm 55/39, 62r.). Such misrecognitions are pervasive to the extent that we think it unlikely that Cook had grasped the information contained in

these 'hidden hazards' stop us from going out to sea altogether? We firmly believe that an acute awareness of the many moments of failed communication should not override the fact that this map was jointly worked upon by these men convinced that meaning *can* be conveyed – however compromised – across the beach; and that Tupaia actively sought to render his geographical and navigational knowledge in a mode of representation that could be grasped by his collaborators.[2]

The only concrete example for 'conjecture' Anne Salmond provides in her response to our essay concerns our reconstruction of the first draft (T1) of Tupaia's Map, a draft that is recorded to have been in the possession of Richard Pickersgill, master's mate on the *Endeavour*, and third lieutenant on the *Resolution*. Since this reconstruction is so essential to our overall argument, we briefly address this charge.

Here is the briefest summary of the evidence: We know from the Forsters' diaries that they held a version of Tupaia's Map with 58 islands in their hands in Raʻiātea in 1773. It was shared with them by Richard Pickersgill, when the Forsters double-checked accounts of surrounding islands given to them by three different local authorities.[3] We also know that, whilst voyaging on the *Resolution*, Johann Reinhold Forster copied island names from a 'map of the Isles about Otahaite' made by 'Toopaia or Parooa' into his 'Insularium'.[4] We finally know that Georg Forster sent his publisher a 'Copy', executed by himself, of a version of Tupaia's Map with 58 islands after their return from the *Resolution* voyage in 1776, with slight differences in the spelling of island names (and two changes of names, both of which were motivated by the Forsters' own encounters in Raʻiātea).[5] The corresponding island list in the 'Insularium', as Salmond acknowledges,

> ordered in three sections according to the bearing of each group of islands from Tahiti (S and SE; W & SW of SSW; and W b. N. to NW. b N), matches the total number and broad alignment of islands in the Forsters' copy of Pickersgill's missing chart.

In short, we in all likelihood have a record of the original names on Pickersgill's chart; we have a copy of the geographic layout of the islands; and there is compelling evidence that both correspond. Still, Salmond claims that 'in the absence of Pickersgill's chart, one cannot claim (as the paper does) that "in combination, these archival resources allow us to accurately reconstruct the lost first draft of Tupaia's Map"' (p. 14).

Absolute certainty is never possible; of course 'we were not there at the time; […] it is always possible that our deductions do not reflect what actually happened'. Yet here we believe

Tupaia's Map even towards the end of the prolonged process of collaborative work on the chart, when he commented on it during the *Endeavour*'s anchorage in Tōtaranui, Aotearoa/New Zealand.

[2] It is this mutual trust in the fundamental possibility for understanding that also speaks from the evocative Spanish sources that Salmond quotes at length in her response. We take the fact that the Moʻorean Puhoro was able to share Society Island knowledge of, among other things, Aotearoa/New Zealand – knowledge brought back to the Society Islands by Hitihiti, who had travelled there with Cook on his second voyage – as yet another indication of the extent to which communication appears to have been possible between Society Islanders and Europeans who travelled together.

[3] Johann Reinhold Forster, 'Journal of a Voyage on Board the Resolution, 1772–1774', Staatsbibliothek zu Berlin, Ms. germ., 227.

[4] Johann Reinhold Forster, 'Insularium Maris Pacifici or a Catalogue of the Isles in the South-Sea with the Names of the Natives', in Forster, 'Vocabularies of the Language spoken in the Isles of the South-Sea & and of the various Dialects which have an Affinity to it; with some Observations for the better Understanding of them', 1774, Staatsbibliothek zu Berlin, MS Orient Oct. 62, 6–7.

[5] Georg Forster, 'Copy of a Chart made by a Native of O'Taheitee, named Tupaïa, Containing about 45° of Longitude', 1776, Stadtarchiv Braunschweig, H III 16–87.

that there is indeed a sound amount of archival evidence, and that our analysis and interpretation is rather straightforward (trained in literary studies, we find these terms more familiar than 'speculation' or 'conjecture'). Vulnerability to critique comes with transparency, and it is this transparency that we find amiss in much previous research on Tupaia's Map.

It should be remembered that the much more famous copy of Tupaia's Map that was rediscovered among Banks's papers in the British Library in the 1950s poses very similar, if not more problems of archival interpretation. It, too, was in all likelihood copied only after Tupaia's death, by a hitherto unidentified European draftsman (the pencil annotation identifying it as copied by Cook is eminently unreliable). Here, too, we have a corresponding list of islands copied from a lost original draft presumably drawn 'by Tupaia's own hands',[6] this time in Cook's own journal, again 'ordered […] according to the bearing […] of islands from Tahiti'. The spellings of island names vary even more dramatically between this copy of the map and Cook's list; and there is not even congruence in kind or number (Tetiaroa is not on the map but in the list; Rimaroa is on the map but not in the list). And yet, generations of researchers have studied the canonical copy of Tupaia's Map for its potential significance, confident that it is a faithful trace of Tupaia's lost original design. Few of their researches have been called 'speculative' histories or compilations of 'conjecture'.

Does the *Avatea* System Offer a New Key for the Reading of Tupaia's Maps?

This takes us to the response by Anne di Piazza and Erik Pearthree. The critique they offer is valuable to us, as it is informed by profound theoretical and, not least, experimental voyaging knowledge following ancestral Oceanic traditions. As landed creatures without any sailing experience, be it on Western or Oceanic vessels, we cannot lay claim to these knowledges. What di Piazza and Pearthree argue is essentially that what we have identified as the *avatea* system does not reflect 'the autochthonous knowledge system', and that it would fail the test of actual navigational practice.

We agree to both points. And we welcome this intervention, as it enables us to clarify more emphatically, perhaps, than we have done in the article that we strictly read the *avatea* system as an *auxiliary device for inter-epistemic translation*. Unlike di Piazza and Pearthree, we do not find conclusive evidence that Tupaia's Map bears the direct traces of Polynesian star and island compasses. In his own practice as a navigator, Tupaia would indeed, as Anne Salmond writes in her response, have 'mastered chants that summoned or calmed winds, and at night […] followed star ancestors in their sky journeys, guided by the star pillars that marked the locations of particular *marae*'. Our key proposition, instead, is that Tupaia attempted to translate the unique epistemic model of Polynesian voyaging into the categorically different epistemic framework and representational model of Cook's maps and Cook's compass. *Avatea*, in David Turnbull's terms, is the key 'cartographic translation device' allowing Tupaia to perform this amazing feat.

In our article, we explain at some length that *avatea* is a category that was indeed largely irrelevant to Polynesian wayfinding. Instead, Tupaia must have observed over a period of four weeks of navigating with and for Cook, how crucial *avatea* (the azimuth position of the sun at noon) was for Cook's calculations of the *Endeavour*'s course and his mapping of Oceanic space. That Tupaia discussed the course of the sun with his collaborators, including its noon position, is evidenced also in a sketchbook by Daniel Solander,[7] where the highest point of the sun is labelled 'o'whavatea te Mahana' (*avatea-te-mahana*; the noon of the sun) (Figure 1). Cook crucially

[6] James Cook, 'Journal of H.M.S. Endeavour, 1768–1771' [Canberra MS], National Library of Australia, Canberra, MS 1, 220v.

[7] Daniel Solander, 'Observationes de Otaheite &ct.', 1769, SOAS, University of London, MS 12892, inside of back cover. In our long essay we reproduced information from the document's catalogue entry and mistakenly identified Joseph Banks as the author. Hank Driessen offers compelling

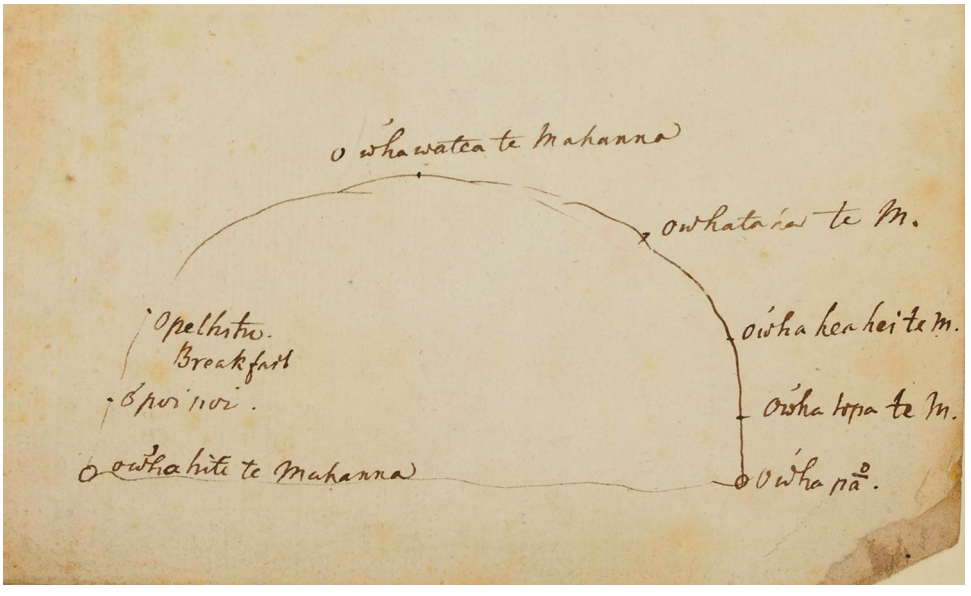

FIGURE 1: Daniel Solander, 'Drawing of the sun's course with Tahitian annotations', in 'Observationes de Otaheite &ct.', 1769, SOAS, University of London, MS 12892, inside of back cover.

relied on sextant measurement of the *avatea* sun, to determine latitude, but also to correct his compass bearings for magnetic variation. Tupaia would also have observed how the Europeans established and recorded bearings of specific locations not by observing wind, swell or distinct *rua* (star paths), but first and foremost by means of the magnetic compass, and thus angular deviations from a standard bearing to the north. Only by acknowledging that the map is a collaborative work, in which Tupaia attempted to translate his 'sea of islands' into a European model, will *avatea* begin to make sense.

If further evidence be needed for Tupaia's extraordinary capacity for abstraction, negotiation and translation between different representational models, let us briefly look at his two *marae* drawings (Figures 2 and 3). We postulate that, in collaboration with Sydney Parkinson and/or Herman Diedrich Spöring, Tupaia sketched both drawings of the same architectural structure, and that these simultaneously ideal *and* factual drawings jointly lay out information on the key elements of *marae* and their significance. Note how the first sketch (Figure 2) chooses an abstracted, bird's-eye view providing a 'floor plan' that follows a cognitive and representational strategy akin to principles of Western mapmaking. The other, more detailed sketch (Figure 3) contains the same structural elements. However, it abandons the abstracted bird's-eye perspective, and instead represents the *marae* as it might have been seen on a walking tour. Not unlike in Tupaia's Map, the perspective here is that of the subject walking on site, showing what is seen when turning to the left (right), or front: In the logic of the drawing, a grounded observer first passes two of the *marae*'s *fata* (offering altars, 1 and 2; the first might also represent the funerary structure of a *fare tūpāpa'u*), situated toward the left; then, after taking a left turn, the observer sees, again to the left, the *fare atua* (god house, 3). Ahead, the visitor finally faces the *ahu* (ceremonial platform, 4), adorned

evidence for its attribution to Daniel Solander, the naturalist in Banks's employ. Hank A.H. Driessen, 'Dramatis Personae of Society Islanders, Cook's "Endeavour" Voyage 1769', *Journal of Pacific History* 17, no. 4 (1982): 227–32.

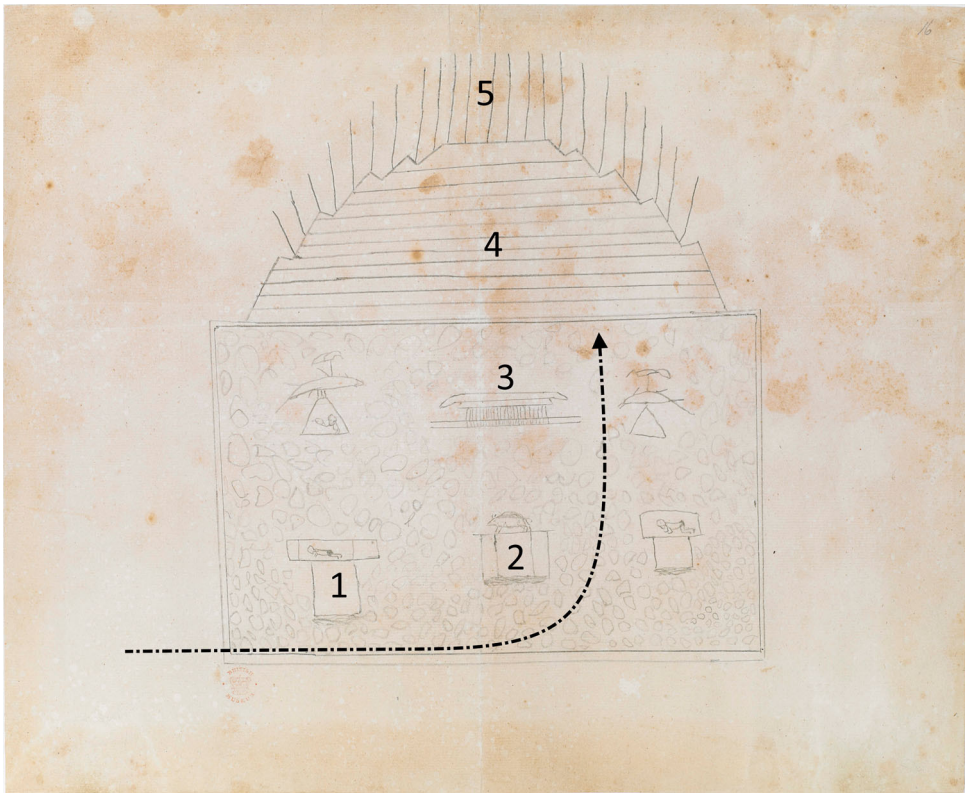

FIGURE 2: 'Diagrammatic drawing of a marae: front elevation with forecourt drawn in plan, drawing by Tupaia', 1769, British Library, Add MS 15508, f. 16 © The British Library, London. We argue that the drawing follows the (European) model of a 'floor plan' (the indication of the path corresponding to the 'tour' as depicted in Figure 3 and numbering of the structural elements is ours).

with a range of *unu* (carved wooden planks, 5) on top, one of which is exemplarily drawn in detail on the right margin. From the corresponding evidence in the journals, we assume that the sketches were begun when at anchor in Ra'iātea, so, clearly before Tupaia's Map was first conceived.[8]

Accepting that Tupaia's Map, too, is not an authentic trace of autochthonous way-finding traditions, but first and foremost a radical experiment in epistemic translation which Tupaia seems to have embraced and enjoyed, is one of the central arguments presented in our article. We do not claim that Tupaia's Map would have allowed Cook (and Tupaia) to successfully find all the islands it depicts, following the cartographic logic Tupaia set into

[8] In an analysis of the correspondences between Sydney Parkinson's journal entries for 21 July 1769 and Tupaia's drawing, Harriet Parsons argues that Tupaia's drawings represent Taputapuāea *marae* at Ōpoa. More important for our argument here, however, is that she also reads the two drawings as depicting the same *marae* structure, albeit according to different representational models: that of the 'tour' and the 'plan'. Harriet Parsons, 'Collaborative Drawing on Captain Cook's *Endeavour* Voyage, 1768–1771: An Intellectual History of Artistic Practice' (PhD diss., University of Melbourne, 2019), 198.

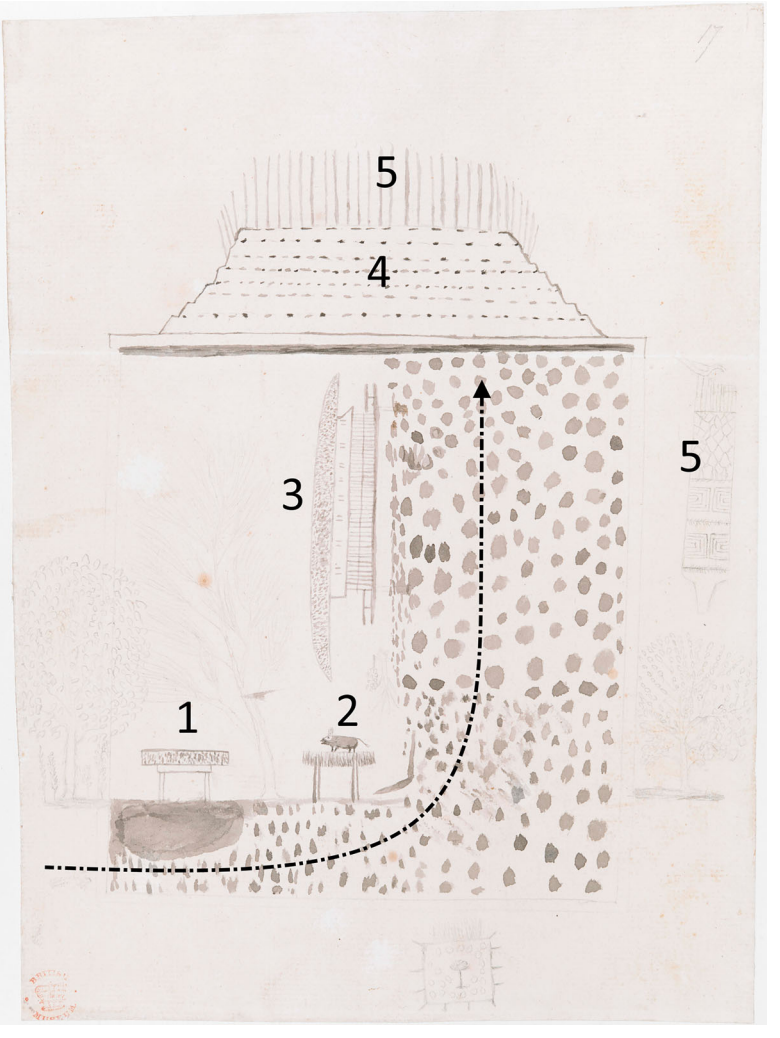

FIGURE 3: 'Diagrammatic drawing of a marae: side elevation, drawing by Tupaia', 1769, British Library, Add MS 15508, f. 17 © The British Library, London. We argue that the drawing consistently follows the model of the 'tour' (the indication of the walking path and numbering of the structural elements is ours).

place. We acknowledge in our essay that landfall in practical navigation for (single) islands, according to David Lewis, would have been possible only within an average arc of some 8° to either side of the target – a standard not met by many *avatea* bearings for island to island voyages as identified by us. A lot of the precision of Polynesian wayfinding would have been lost in the processes of cartographic translation, for various reasons.

The original draft maps drawn 'by Tupaia's own hand' were probably as small in format as the copies held by the Forsters and Banks,[9] and presumably sketched by Tupaia

[9] Georg Forster's copy of Tupaia's Map (T1/GF) in a letter to his publisher Karl Philipp Spener archived in the city archive of Braunschweig (Brunswick) is rather minute: the page (which also includes a passage of the letter writing on top) is 249 mm×192 mm; the frame of the chart itself

without recourse to instruments (like rulers or protractors). And yet: Tupaia drew the first paths he entered – from Rurutu to Ra'ivavae, and from Rarotonga to Niuē and from there to the Vava'u–'Uiha chain, with astonishing precision. All these islands can be clearly identified by linguistic evidence on the maps, and here, indeed, the deviations from true geographic bearings are well under 5°. We argue that it was with these voyaging paths that Tupaia first established the *avatea* system, apparently with great care to set it off from the Western projection the Europeans had set up for him. In the further course of the project, with increasing numbers of islands to be sketched for Cook and his men, Tupaia seems to have allowed himself to be less precise, and to translate his voyaging epistemology in quicker or more makeshift ways. It may have sufficed for him to give his European collaborators a rough sense of direction for many of the routes. Where Tupaia would have had knowledge from tradition rather than experience, especially in the more remote voyaging paths (such as from Rotuma to the Niua group, or toward Rapa Nui), moreover, the bearings are – as acknowledged by us – quite predictably less precise.

Despite these deviations (which we document for every path), we stand by our conviction that the *avatea* system firmly holds. It works for *all* routes (always provided that our identifications are correct) entered onto the first draft of the map (T1). That *avatea* does not hold for the voyages within the Tuāmotu group, only entered onto the second draft of the map (T2), does not delegitimize the system as a whole. We have proposed why Tupaia would have felt obliged to deviate from his system for the Tuāmotus (an archipelago his collaborators had partly charted themselves before, and where epistemic confusion and European interference is hardly surprising).

So here are the statistics: The average deviation of *avatea* bearings from true geographical bearings on the voyaging paths on T1 is ca. 16°; on T3 (excluding the Tuāmotu group) it is ca. 18° (out of 360°) – this is a deviation of 5 per cent (on T3) or even less (on T1). The deviation for voyages between islands which can be clearly identified by linguistic evidence on T1 (11 out of a total of 34 connections) is still smaller (only about 10°). An average deviation of around 5 per cent (and a maximum deviation of under 20 per cent) simply cannot be accidental – what are the statistical odds? There very clearly is a transparent pattern. What is more: even though the two surviving copies of Tupaia's Map look so very different at first sight; even though the distances between islands are substantially expanded on T3; even though some island positions have significantly changed (compare, for instance, the positions of Vava'u and 'Uiha on T1 and T3) – the *avatea* bearings on the routes we have identified are *very* consistent on both copies of the map.

But statistics distract from the truly amazing feat of Tupaia's Map: They ignore that Tupaia will have calculated all these *avatea* bearings by transposing them from a completely different epistemology; from a system of island finding which drew on multiple variables including seasonal winds, swell, directional stars (*rua*), pillar stars (*pou*), sun, moon, planets, constellations, deep sea phosphorescence, sea life, bird life, etc.; from a knowledge organized primarily through embodied narrative, informed by a categorically different sense of relation between self and world, drawing on a completely different cosmogony. Tupaia was *not* directing a *va'a motu* with Cook and his men from island to island to island. He was drawing a two-dimensional chart, something that was entirely alien to him before he met Cook. As we see it, that there is less than 5 per cent deviation between his *avatea* bearings and the bearings Cook's compass would have shown is mindboggling.

only measures 223 mm×141 mm. Bank's canonical copy of Tupaia's Map (T3/B) in the British Library in London is slightly larger: the size of the sheet on which it is drawn is 403 mm×272 mm; the ink margin of the chart measures 345 mm×210 mm. Thanks to Hartmut Nickel of the Braunschweiger Stadtarchiv and to Laura Walker of the British Library for providing the precise measurements.

Alternative Perspectives on Tupaia's Mapmaking

This takes us to Atholl Anderson's critique of an overreliance on ethnography and ancestral narrative, paired with a presumably uncritical attitude towards the 'modern traditionalism' invigorated by the ongoing revival of experimental voyaging. We suppose that as scholars with an academic home in postcolonial literary and cultural studies, these are indeed the discourses we are most drawn to. This does not mean, however, that we have not done homework in other fields, certainly including Pacific archaeology. Whilst we are not prepared to embrace Anderson's minimalist approach to Polynesian voyaging, we are very grateful for his response, as it gives us a chance to clarify, perhaps rectify, some of our claims about 'the extent of Tupaia's voyaging'.

In our essay, we discuss at some length how Cook revised his first account of the islands 'Tupaia himself has been at', if only in Orton's copy of his journal, from initially only a dozen islands in the near vicinity of Tahiti to a much larger number.[10] In our reading, Tupaia claimed to have travelled 'to the Marquesas in the northeast, via the Tuāmotus; to Rapa Nui in the east, via Mangareva and Pitcairn; and to 'Uvea in the west, via Rarotonga, Tonga and Samoa' (p. 90). This statement we have not sufficiently qualified.

One of the key differences between Polynesian and European epistemic traditions, foregrounded so convincingly by Anne Salmond and David Turnbull, certainly concerns the notion of self and personhood. On the European side, Cook's voyages roughly coincide with the gradual formation of the monadic, bounded subject of the Enlightenment, already on its way to becoming the hallmark of (capitalist) global modernity. Tupaia's sense of self, by way of contrast, would have been far more inclusive, incorporating, among many other things, his *whakapapa* (in Māori terms). This sense of self speaks toward the strong genealogical resonances in the map. We must acknowledge that in our article, we could have explained with greater care that when we speak of Tupaia's voyaging, this probably encompasses both Tupaia as a historical person, and his ancestors.[11]

[10] James Cook, 'Journal of H.M.S. Endeavour, 1768–1771' [Mitchell MS], State Library of New South Wales, Sydney, Safe 1/71.

[11] Evidence of the role of ancestral traditions in Tupaia's claims to navigational knowledge can be glimpsed, for instance, in a letter by Johann Reinhold Forster to his publisher Spener, dating to 21 February 1772, in which Forster describes plans for Cook's second circumnavigation and appears to recount information gathered from Tupaia on the *Endeavour* voyage: 'After they have refreshed themselves here [Utahitti] for a short time, the voyage will proceed to New Guinea, discovering on the way more than 70 islands, of which Tobias has given them an account, whose father found so many in the course of a three-month voyage, until he came to a large country which, to judge from all the circumstances, must be New Guinea; but he needed 9 months for the return journey'. Johann Reinhold Forster in David Paisey, 'Letters by Johann Reinhold Forster about Captain Cook's First Voyage and the Preparations for the Second', *Terrae Incognitae* 43, no. 2 (2011): 118–19; transl. from the original German. The German letter is wrongly attributed to Georg Forster in the (East) German Academy Edition of Georg Forster's collected works, see Paisey, 'Letters', 114. This passage is surely replete with linguistic and cultural misunderstandings of the kind that Anne Salmond foregrounds in her response; and we can only speculate about Forster's source regarding the one-year voyage by Tupaia's 'father' to 'New Guinea'. Still, from the *Endeavour* archive we know that both the Forsters and Cook's crew tended to understand the Tahitian word *tupuna* to mean 'father' or 'grandfather'; *tupuna*, however, is better translated as 'ancestors'. It seems that Tupaia, when reportedly talking about the extent of his 'father's' voyaging, in actual fact shared navigational knowledge embedded in his *whakapapa*.

This matters especially for the long voyaging paths in the northern and easternmost extensions of the Polynesian triangle. Here, archaeological evidence suggests that long-distance interaction spheres had broken down several generations before Tupaia's time. Still, the memory of these voyages would have been preserved in detailed chants; chants which surely formed a firm part of Tupaia's genealogical, historical and navigational education at Taputapuātea *marae*. Against Anderson's call for restraint, we would thus like to defend our identifications of voyaging paths to Pitcairn and Rapa Nui, and to O'ahu in Hawai'i respectively.

The path to Pitcairn (and beyond)

Both Anderson and di Piazza and Pearthree challenge our identification of Pitcairn Island, first and foremost by calling upon the great Greg Dening. Dening in turn challenged Beaglehole, who was the first to have recourse to the Tahitian version of the legend of Rātā (as recorded by Rev. Orsmond and edited by Teuira Henry) to identify 'Pitcairn and Mururoa, Mangareva and Timoe on Tupaia's list'.[12] In a footnote, Dening argues that Pitcairn was no longer inhabited when the first Europeans arrived, making it impossible to verify this identification. This argument is rather lame by Dening's standards, and only begins to make better sense in the context of debates about Tupaia's Map itself. Dening tended to follow Horatio Hale, who argued that the Europeans probably confused the terms for north and south in the mapmaking process – a theory which conveniently explained, for instance, why islands that can be identified in the Southern Cooks and Australs show in the map's *upper* left quadrant. Hale assumed, however, that the terms for east and west were correct. By these standards, the island chain including *Hiti-poto* and *Hiti-au-rereva* ranges west from the identifiable islands in the Samoa group – and thus Dening tended to follow their identification as Fijian.[13]

If our identification of the *avatea* system overriding the cardinal orientation set up by the Europeans is correct, this argument is certainly no longer valid. And a closer analysis of the legend of Rātā really supports the identifications of Mangareva, Temoe and Pitcairn by Orsmond/Henry. Note that in the legend, both 'the *hilly* island of Hiti-poto' and 'the then populous little *mountainous* island of Hiti-au-rereva' are described as high and volcanic. For Pitcairn in particular, this features prominently not only in Orsmond/Henry's English paraphrasing of the Tahitian legend, but also in the original Tahitian phrase: 'Hiti-au-rereva mara'a i ra'i', translated as 'Hiti-au-rereva that rises to the sky'.[14] We hold it very unlikely that this phrase is a post-contact adaptation of the legend, informed by the history of the *Bounty* mutineers. Anderson's alternative interpretation that the island chain on the map ranging east from *Hiti-poto* (Mangareva) is more likely to lead into the south-eastern Tuāmotus is clearly at odds with this fact – for the only volcanic island beyond Mangareva in this part of the ocean *is* Pitcairn.[15]

[12] G.M. Dening, 'The Geographical Knowledge of the Polynesians and the Nature of Inter-Island Contact', in *Polynesian Navigation: A Symposium on Andrew Sharp's Theory of Accidental Voyages*, ed. Jack Golson (Wellington: Polynesian Society, 1962), 103, note 11.

[13] Hale argued that 'Hiti is the form which the Samoan word Fiti (Feejee) would take in Tahitian', Horatio Hale, *Ethnography and Philology: United States Exploring Expedition, 1838–42* (Philadelphia: Lea and Blanchard, 1846), 122–4, qu. 123; and Dening, too, assumed that 'Samoan, Tongan and Fijian groups are known in some detail' on the chart. Dening, 'Geographical Knowledge', 103.

[14] Teuira Henry, *Ancient Tahiti, Based on Material Recorded by J.M. Orsmond* (Honolulu: Bernice P. Bishop Museum, 1928), 472, 777.

[15] In the legend, the path to *Hiti-au-rereva* (Pitcairn) is either via Mangareva (the route chosen by Rātā himself and most of his kin before him), or alternatively 'through the Tuāmotu group,

In short, we still believe that there is good evidence that Tupaia sketched a route with two stops (Temoe and Oeno) from Mangareva to Pitcairn Island, with three more islands ranging on the same path further to the east. This is consistent also with more recent archaeological research by Marshall Weisler, among others, postulating a sustained trading network that connected the Austral and Society Islands with Mangareva, Pitcairn, Henderson and Ducie. Mangareva and the Pitcairn group appear to have formed a singular cultural unit in this context which probably collapsed about three to six generations before Tupaia's time.[16] The voyaging paths beyond Mangareva on Tupaia's Map would thus have represented ancestral voyages, presumably as part of Tupaia's genealogical tradition. They are very unlikely to be based on personal or recent voyaging – hence also the deviations in bearings, especially to (if we are correct) the only plausible target to the eastward from Henderson and Ducie: remote Rapa Nui.

Molyneux's list and the path to Hawai'i

Whilst we accept the question mark raised over our identification of Rapa Nui (given both that there is little genetic, linguistic or archaeological evidence for any sustained interaction period, and that Tupaia's *avatea* bearings are pretty far off),[17] we are not prepared to let go of the identification of O'ahu in the Hawai'i group without seeing clear conflicting evidence. Our defence of the path to Hawai'i requires a brief detour via another defence, namely against Anderson's assertion that 'Molyneux's sequence was not a blueprint for Tupaia'. We are very confident that Molyneux's list *was* on the great cabin table when much of the map was collaboratively drawn. We acknowledge that the document was not slavishly followed, that work with Molyneux's sequences was interrupted at several stages to include islands not on the list, and that as work progressed, Tupaia and his collaborators jumped between sections in the list (in at least two instances). But there is solid evidence to support that the list mattered, if not from the outset.

Again, we assume that the first draft of the map was set up by a European hand for Tupaia (entering the cardinal axes, and the islands in the Society group the crew had themselves seen, plus Rurutu). There is clear evidence for this on T1. Tupaia's work on the map then began in the context of a dialogue about possible voyages from Rurutu to the east and west, as recorded for 15 August 1769 by Cook and several other officers. This resulted in Tupaia establishing the *avatea* system, and drawing a path to Ra'ivavae in the east, and a route from Rarotonga to Tonga in the west. Only once this dialogue was concluded, we assume, did Molyneux's list enter the conversation, with islands 3 and 4 in the first section (western outliers of the Society group), and then especially the sequence 7–16 in the second section. The sequence 7–13 clearly ranges from the Southern Cooks through the Austral chain; 14–16 mark a path from Rotuma to Samoa. Let us just highlight, once more, one of the most striking pieces of evidence that Molyneux's list was at play in the making of

touching here and there for fresh coconuts and other provisions'. This (safer) route, according to the Tahitian version of the legend, is taken by Rātā's mother, 'first landing [at] Anâ [then] gradually descend[ing] southeast, touching at Marorau, and pass[ing] the great atoll of Hao'. Henry, *Ancient Tahiti*, 481.

[16] Marshall Weisler and Richard Walter, 'East Polynesian Connectivity', in *The Routledge Handbook of Archaeology and Globalization*, ed. Tamar Hodos (New York, NY: Routledge 2017), 369–86. Pitcairn and Henderson largely depended on sustenance from Mangareva, whilst Pitcairn provided superior basalt stone and volcanic glass. Henderson seems to have become a prime location to resource ritual feathers and turtle once their stock was depleted around Mangareva.

[17] The only plausible alternative that we can see is to then identify T1: Geotowhete; T2: Teatowhite; T3: Teatowhete as a target on the South American coast.

Tupaia's Map: how else would one explain that Rotuma (M 14) was first placed just beyond the last island in the Austral chain (Rapa Iti, M 13) on T1, other than by assuming that Tupaia first drew it there (or a European hand first identified it there) simply because it continued the previous sequence in Molyneux's list? And that upon recognizing this mistake, Tupaia relocated Rotuma to the centre of the upper left quadrant, to disambiguate a new voyaging path from Rotuma to Samoa, at the other end of his world?

We repeat this argument because the assertion that Tupaia, Cook and his other collaborators basically worked from Molyneux's list is key to our identification of 'Oahourou' as O'ahu in the Hawai'i group. Following the logic of the list, there is strong evidence to support that the last islands Tupaia entered onto the first draft of the map (T1) are three major islands in the Marquesas group (Nuku Hiva, Hiva 'Oa, and 'Ua Pou), plus a name for the entire group (*te-fenua-tane*) and *Oahu-roa*. Molyneux's list places 'Oahurou' ('Woahaowroo' in Molyneux's corrupted transcription) firmly within a Marquesan context; in the composition of the map however, Tupaia places the Marquesan islands and 'Oahourou' at opposite ends, clearly marking difference and distance. This, in conjunction with the fact that the *avatea* bearings from the Marquesas (*te-fenua-tane*) to O'ahu are very accurate, we read as very strong evidence that 'Oahourou' is indeed O'ahu in Hawai'i.

We do not argue in this context that the chant 'The Birth of New Lands' was the immediate model for this voyage – the chant takes a different route via the Tuāmotus (for example, suggesting Pukapuka, rather than Tepoto/Nāpuka as departure island to the Marquesas) and remains ultimately inconclusive about sequences between the Marquesas and O'ahu. What we assume, rather, is that Tupaia had a similar model in mind, a different but related chant which, like innumerable others, must have disappeared with the last Tahitian master navigators. We concur with Anderson that there is no evidence in the archive that Tupaia (or his ancestors, for that matter) personally travelled beyond the Marquesas. Yet again, we assume that the long path to Hawai'i was a firm part of the genealogical voyaging memory Tupaia acquired as an *arioi* at Taputapuātea *marae*.

With our focus on the critiques of Salmond, di Piazza and Pearthree and Anderson, we were able to refer to David Turnbull's thoroughly supportive commentary only in passing. We are, of course, very happy about his endorsement of our work. As a historian of science, Turnbull might be better disposed to accept a reading that foregrounds the processes of collaboration and necessarily improvised acts of translation between the 'apparently incommensurable knowledge traditions' that have enabled Tupaia's Map. He suggests that we need to understand such acts of translation ultimately as performative and fostered by the sustained collaboration of actors on complex tasks such as the joint navigation of a sailing vessel through an archipelago or the drawing of a map. We agree, of course, and feel we should mention here – as acknowledged throughout our essay – that our research remains inspired by Turnbull's concept of performative, collaborative knowledge production. We believe that with our detailed reconstruction of the map-making process on board the *Endeavour* we have been able to provide evidence for several instances in which these performative acts of translation were at least attempted, if not always understood.

We are grateful for Turnbull's suggestions about the possible future relevance of our findings, some of which we did not anticipate, including research into the socio-cultural variability of cognition. Closer to our heart are the links he establishes between our work and the renaissance of canoe building and Indigenous navigational knowledge across Oceania. More than anything, these suggestions remind us, once again, that work on Tupaia's Map is humbling. Finding ourselves at the receiving end of Tupaia's translations, we have ever increasingly felt how little we know, and may know, about Polynesian ontologies and epistemologies. The more we gradually figured out about the logic and scope of the chart, the more acutely aware we have become of the limitations of our own positionality and perspective. Our work on the map offers mere glimpses into the Oceanic wayfinding traditions and the complex worldings that Tupaia sought to convey. Whatever we could glean is deeply indebted to decades of research on Tupaia's legacy by Indigenous and non-indigenous scholars who came before us, on whose insights we understand ourselves to be building. We have learned immensely

from the engaged and erudite responses that we have received from many people on this journey, not least in this forum. Every step along the way, they have reminded us that our contribution can only ever be one voice among many; a contribution that we nevertheless want to assert with some confidence as the first comprehensive reading of Tupaia's Map. Given the vibrancy of the current debate, we are hopeful that a fuller understanding of Tupaia's legacy will emerge through future discussions. Such conversations, we believe, now crucially rely on interventions by Oceanic readers and their ability to bring Tupaia's Map in conversation again with Oceanic traditions and worldings very much alive today.

LARS ECKSTEIN
Institute of English and American Studies,
Universität Potsdam, Germany. lars.eckstein@uni-potsdam.de

ANJA SCHWARZ
Institute of English and American Studies,
Universität Potsdam, Germany. anja.schwarz@uni-potsdam.de