From Earth to Enlightenment
Materiality, Technology and Cultural Transmission of Terracruda Sculpture Across Buddhist Asia
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Flesh of Clay
Instructions for Making a Figure from Unbaked Clay

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Abstract The article treats the *Vimānārcanākalpa*, chapters 17 and 18 of which describe the procedure for making unbaked clay (terracruda) figures that are established permanently in place, as a part of the building around them. This text, being dated to the 9th century, is the earliest such account available to us, and is rich in instruction, both technical and ritual. An edition in Roman transliteration and English translation of both chapters are presented, along with a framing discussion.

Keywords Vimānārcanākalpa. Textual instruction. Technique. Ritual. Vaikhānasa.

Summary 1 Introducing the Text. – 2 Field Background. – 3 Methodology. – 4 Analysis. – 5 Links to the Edition and Translation. – 6 Ramifications.

1 Introducing the Text

Presented here is an edition in Roman characters, an English translation, and an analysis, of chapters 17 and 18 of the *Vimānārcanākalpa* (henceforward VAK). In taking part in this writing project, the aim is, of course, to increase access to this particular textual material, and to further the comprehension of the tradition it represents.[1] It is exciting, too, to bring the material into the enriching conversation that is this book, laying the old techniques and viewpoints of the VAK beside the newer methodological approaches and interpretations presented in the volume.

1 To compact the material down to something manageable in print, the edition and translation are posted at Zenodo, `https://doi.org/10.5281/zenodo.23272304`, leaving space here for the discussion, including details of methodology, analysis, and future planning.

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The VAK, being dated to the 9th century, is the earliest extensive account available to us of the unbaked clay (terracruda) sculpture-making process. It is chosen in part for that reason, and also for its relative compactness and completeness.

It belongs to the *Vaiṣṇava* tradition, that tradition which takes Viṣṇu as the principal deity. Within the *Vaiṣṇava* tradition, there arose two chief movements: the *Pāñcarātra* and the *Vaikhānasa*. Current thinking holds that the *Pāñcarātra* movement had authoritative texts by the 7th century, while the *Vaikhānasa* textual record begins in the 9th c. (Colas 2018). A determination of a geographical origin for the movements is difficult: while the manuscript record is largely South Indian, Colas points out that the *Pauṣkarasaṃhitā*, an early *Pāñcarātra* text, refers to sacred locations in both North and South India (Colas 2018).

The *Pāñcarātra* and *Vaikhānasa* movements come to place themselves in opposition to each other. They do so in terms of both affiliation and practice. In the *Pāñcarātra* movement, affiliation is by initiation, while that in the *Vaikhānasa* movement it is by heredity. And difference in practice is discussed in terms of a contrast between a tantric nature for the *Pāñcarātra* stream and a Vedic one for the *Vaikhānasa*. However, these oppositions must be understood to be nuanced (see Colas 2018), and the VAK is recognisable as a tantric text, in structure and content.

The VAK is understood to be the earliest of the *Vaikhānasa* texts. Like much of the corpus, it concerns every aspect of temple ritual. Its very name tells us so: this is the procedure (*kalpa*) for worship (*arcana*) in a temple (*vimāna*). It is also an interestingly hybrid text. In the first instance it is very much a *Vaikhānasa* composition, attributed to the sage Marīci, and detailing the procedure for *Vaikhānasa* temple ritual. But it also includes a remarkable account of yogic practice in preparation for that ritual. James Mallinson and Mark Singleton (Mallinson, Singleton 2017) have demonstrated that its account represents a transition in yogic practice, from the predominantly seated postures of earlier *yoga* accounts to non-seated and dynamic ones that influence later *haṭha* traditions of *yoga*.

Its alternative name, the *Marīcisaṃhitā*, which indicates its authorship, as the compilation (*saṃhitā*) of the sage Marīci, takes us back to its origins. Its usage, on the other end of the scale, carries us forward to the present, in that this remains a guide for artists producing deity images in South India today (Colas 2018, paragraph on "Levels of Ritual Action"), a factor that makes it a particularly useful text for our purposes. But there is a subtlety to add here. While deity images in stone and metal are still made and used in South India as directed by this text, the tradition of making permanent images in terracruda died out in this region at about the time of the composition of the VAK. This part of its record became, for South India, something stuck in time, no longer used, even as terracruda technology continued to thrive elsewhere, beyond South India. However, the situation is more nuanced than it might seem, in that, while widespread production of permanent terracruda temple images has died out in the region, elements of the technology appear to survive. López-Prat et al. 2025 point out that, while permanent terracruda images are no longer produced, there is an ongoing manufacture of ephemeral ones, for temporary ritual use, using recognisably alike materials in a layered technique.

The VAK is one of a number of South Indian accounts of the terracruda construction from unbaked clay composites of images for permanent

installation in a temple. Of these accounts, five are particularly useful to this project. The first two are roughly 12th-century works, and *Śaiva* (dedicated to the deity Śiva): the *Kāśyapaśilpa* (henceforward KŚ) and the *Kāmikāgama*. The next two are roughly 16th-century, and *Vaikhānasa*: the *Atrisaṃhitā*, also known as the *Samūrtārcanādhikaraṇa*; and the *Kāśyapajñānakāṇḍa*, also known as the *Kāśyapasaṃhitā*. The last is the *Śilparatna*, a 16th-century treatise on architecture and iconography which, while its opening invocation is to Viṣṇu, treats material supports in an inclusive manner, across traditions.

The accounts at the KŚ and *Śilparatna* are very close parallels, large sections being similar enough to indicate borrowing on the part of the *Śilparatna*. Other than that close pairing, the texts treat the same procedure, but each in its own manner, and with differences of detail.

The present analysis will draw from all of these sources. It is of interest to note how quickly, though, the record runs dry as one moves out of South India. A survey of North Indian *Vaiṣṇava* and *Śaiva* texts has so far yielded no substantial parallels, beyond short passages discussing the preparation of clay composites for buildings rather than figures. The investigation continues. To date, no Buddhist texts directly addressing the technology have yet been identified.

It is worth thinking about the intended audiences of the texts used here. Among them, the *Śilparatna* is the only full-on *śilpaśāstra*, that is, a text (*śāstra*) specifically designed to convey information on the arts (*śilpa*) of architecture and iconography. The KŚ is, as Ślączka 2007, 11-13 shows us, an interesting combination of *śilpaśāstra* and *tantra*. The rest are all tantric texts, with a wider goal of presenting every aspect of worship within their particular tantric stream, including the creation of architecture and icons as substrates for it. Interestingly, the tantric VAK, at Chapter 17 paragraph 28, itself acknowledges this distinction when it refers one to the *śilpaśāstra* tradition to fill in any procedure that it misses.

In the chapters that treat terracruda one notices the difference between the two types of text. The *Śilparatna* and KŚ read as records for makers rather than ritual protagonists, including, for example, full recipes for making the materials used. The remaining texts also treat manufacture but always couched in ritual. They need to deliver both, so that the ritual officiants and artists, working side by side, can each follow enough of what the other side is doing, but not necessarily in full detail.

One may wonder, then, why the KŚ (or *Śilparatna*) was not chosen as base text for this study. The reasons are two: first, since Varma 1970 grounded his presentation in the KŚ, with reference to the parallel account in the *Śilparatna*, it is good to widen the textual base available in translation; and second, it is important that the ritual work that is the needed concomitant of the artistic one be squarely here before our attention. To address any gaps on the technical side, a materials-and-technology-focused translation of the terracruda account in the KŚ, is underway for future publication.

2 Field Background

The present work is made possible by editions published over the course of the past century, and the digitising of manuscripts by such bodies as the Institut Français de Pondichéry. Also invaluable is Goudriaan's 1965 English translation of the *Kāśyapajñānakāṇḍa,* accompanied by annotations

and glossaries. More tightly aimed at terracruda in particular, and highly influential in connecting terracruda sculptural technology with the South Asian textual traditions, is Varma 1970, a study with a broad vision, working from three types of source: texts, archaeological finds as evidence of past practice, and present practice as seen in Bengal. Varma presents an analysis of what each type of source can yield, together with the results of his experiments to create the objects of study.

He bases his textual analysis mostly on the KŚ, with support from the *Vimānārcanākalpa*, *Kāśyapajñānakāṇḍa*, *Atrisaṃhitā*, and *Śilparatna*. He acknowledges that he does not treat every topic in the written record. The aspects that he chooses to omit are: the ritual that accompanies the construction of the clay image, instead confining the study to questions of construction technique alone; and attention to the 8-fold binding medium (*aṣṭabandha*), limestone paste (*śarkarākalka*), cloth (*paṭa*) and pigment (*varṇa*) layers, instead focusing on the armature (*śūla*), rope (*rajju*), and clay (*mṛd*) layers. Additionally, in his construction experiments, he uses plain clay, rather than the complex clay-composite recipes taught in the texts.

His synthesis is very useful, and one follows with interest his experience as he experiments with the technology, finding the problems and solutions to them, or discovering the purpose of a step that might not at first sight have seemed worth it. But a synthesis inevitably loses the distinct voice of any single text. The hope, in this much more modest study, is to add a sense of the full voice of just one text as it describes the entirety of the production process in both ritual and material domains. To further round out the picture, one might want to compare the account of the VAK with that of the *Kāśyapajñānakāṇḍa* as given in Goudriaan's 1965 English translation.

3 Methodology

In presenting two complete chapters from the VAK, annotated as needed with material drawn in from other parts of the same text and other related sources, the intent is to give a full picture of this telling, so that readers can draw from it their own conclusions. The chapters describe the entirety of the process, in both ritual and material domains, and emphasis is placed on the importance of doing the work precisely and without hurry. The reader who is interested only in production technology will have to be patient as it emerges from a bedding of ritual action and speech. That ritual practice, and the thinking behind it, should be understood as important to the slow, careful and respectful work that produced the beautiful and enduring creations that are our central interest here.

The analysis is here kept separate, as would be a commentary on the text if there were one. On that point, it is worthwhile to stop and think about the fact that there is no commentary. Sanskrit holds a literature full of commentaries upon commentaries. But, in the more technical corners, such as the one we are in here, the instructions given are generally designed to be clear enough to stand alone.

The style of the text is plain, more communicative than beautiful, and the translation will be plain too, to reflect the instructive mode of the original without, as far as possible, translator overlay. There are plenty of technical terms. As each is introduced, the underlying Sanskrit equivalent will be highlighted.

4 Analysis

The VAK, in chapters 17 and 18, describes the procedures behind the shaping of an enduring figure from unbaked / terracruda clay (*mṛd*). The Sanskrit term *mṛd* may, in fact, refer both to plain earth, as dug from the ground (see, for example, chapter 18, paragraphs 31 and 34), and also to the malleable clay composites made from it (see, for example, chapter 18, paragraph 36). The reader needs to be attuned to what is going on, in order to decide which is meant in any particular passage.

The English and Italian terms 'unbaked' and 'terracruda' also need addressing. 'Unbaked' stands well for the Sanskrit *apakva*, which translates directly as 'uncooked / unbaked', rather than 'cooked / baked' (*pakva*). 'Terracruda' comes at the matter from a slightly different angle, referring as it does, more positively, to the raw, rather than uncooked, nature of the clay. But, as the natural counter to 'terracotta', it is a useful term for the resulting sculptural tradition, as discussed in a broader context; and it serves well to communicate the important point, which is that the clay, while admixed with other ingredients, ground, wetted, dried, and matured, is never baked.

It is noteworthy that this account specifically recommends creation with clay (*mṛd*) that is unbaked (*apakva*), rather than baked (*pakva*): VAK chapter 64, which treats remediation (*prāyaścitta*) in the case of wrong procedure or damage to the materials of worship over time, pointedly warns against the use of baked clay, including it in a list of factors that bring harm.

> *dhruvaberaṃ* [...] *pakvamṛṇmayaṃ* [...] *ajñānād arthalobhād vā sthāpitaṃ cet tad ābhicārikaṃ bhavati*.
>
> If (*cet*), through ignorance or error (*ajñānād arthalobhād vā*), a permanent image (*dhruvabera*) made of [...] baked clay (*pakvamṛnmaya*) [...] is established (*sthāpitam*), it becomes harmful (*ābhicārikaṃ bhavati*).

The unbaked nature of these figures is, then, not a happenstance or convenience, but a positive choice, and important to their meaning and function.

On the other hand, one should also note that other texts of this genre do permit baked clay for certain peripheral deities, for example *Atrisaṃhitā* chapter 19.66-70, which begins with stipulating that the principal deity should be unbaked, considers baking optional for certain minor deities, and ends by recommending baked clay for demons:

> *sthānake cāsane caiva śayane ca vidhiḥ smṛtaḥ*
> *mṛṇmayaṃ dvividhaṃ proktam apakvam pakvam ity api*
>
> The procedure has been taught for standing, sitting, and recumbent images.
> Clay [images] are said to be of two kinds: unbaked and baked.
>
> *pūrvoktaṃ mṛṇmayaṃ yat tad apakvam abhidhīyate*
> *mṛdā kṛtvā'gninā dagdhaṃ yat tat pakvam itīritam*
>
> The clay [image] discussed so far is designated as unbaked.
> That which is made of clay and fired with flame is declared to be baked.

apakvaṃ mṛṇmayaṃ viṣṇoḥ kārayeta vidhānataḥ
yadi pakvaṃ ca kuryāc cet sarvanāśakaraṃ bhavet

One should have the clay image of Viṣṇu made unbaked, according to the rules.
If one were to make it baked, it would bring about total destruction.

sarveṣām api devānām apakvaṃ beram ucyate
jyeṣṭhāyāś cāpi kuryāc ced apakvaṃ pakvam eva vā

For all gods, the image is said to be unbaked.
However, for Jyeṣṭhā, one may make it either unbaked or baked.

vakratuṇḍasya śāmboś ca pakvaṃ vāpakvam eva ca
piśācānāṃ ca sarveṣāṃ pakvam eveti kīrtyate

For Vakratuṇḍa (Gaṇeśa) and Śambhu (Śiva), too, it may be baked or unbaked.
For all the demons, it is proclaimed to be baked only.

While *Vimānārcanākalpa* chapters 17 and 18 discuss only fully three-dimensional terracruda sculptures, other chapters treat other operations. There are sections that guide the creation of images in stone, metal and wood, and chapter 15 includes those that are less than fully 3-D, assigning three possible grades of depth: *citra* (3-D statue), *ardhacitra* (bas-relief) and *ābhāsa* (flat representation).

Something remarkable to note is that this text, like the others of its genre, is altogether unillustrated. Every step of this highly visual creation is described in words alone. And those words are delivered in a distinctive category of the Sanskrit language termed *Aiśa* (divine). *Aiśa* material is not required to follow standard language rules, but is free to work in its own register, with non-standard spelling and grammar being taken as markers of divine origin. An excellent account of *Aiśa* language may be found in the introduction to Goodall 1998. As is observed by Oberlies (2003, xxxi), *Aiśa* and standard forms will, at times, both appear in the same passage, with the *Aiśa* structures often introduced to meet metrical rules.

The VAK is presented in prose, but other such texts, the *Atrisaṃhitā*, KŚ, *Śilparatna*, and *Kāmikāgama*, for instance, are composed in metric verse, for ease of memorisation, with the many technical terms neatly folded into a catchy rhythm. This material is full of numbers and proportions. To assist in fitting numbers into the metre of verse, and sometimes in prose, too, many synonyms for numbers are used. Besides the standard number words: *eka, dvi, tri*... (one, two, three...), other words, termed *bhūtasaṃkhyā*, are used as alternative number words. In this system, an object that has a tight association with a particular number is used to stand in for that number. So, for example, since eyes come in twos, words that mean 'eye' (*netra*, *nayana*, *īkṣaṇa*) may stand in for the number two. VAK chapter 22 gives a full account of the *bhūtasaṃkhyā*s used in the text, as tabulated in the footnote VAK chapter 17 paragraph 16.

Besides being full of numbers, the textual material is packed with linear measurements, the rules for which are also set out in VAK chapter 22. It is a system of relative measures which, for images, is centred on the *aṅgula*

(finger breadth), a unit of which there are 3 types: the *māna aṅgula* (an absolute measure); the *mātrā aṅgula* (a measure determined by the size of the middle joint of the finger); and the *dehalabdha aṅgula* (a measure determined according to the height of the image), which is the one we will see used here, for example at VAK chapter 17 paragraph 14. The *aṅgula* is subdivided in a one-eighth system descending down to the miniscule, of which all we need to know here is that 8 *yava*s (barley-corns) make one *aṅgula*. Multiples of the *aṅgula* that will be referred to are: the *tāla* (palm), which is 12 *aṅgula*s and the *hasta* (fore-arm) which is 24.

Our focus in the present study is an examination of the ways in which the VAK presents its account of the procedural knowledge behind the production of unbaked clay figures. That knowledge is highly practical, and the VAK gives detailed attention to each stage in the process, both ritual and material, for three classes of participant – ritual officiant (*ācārya*), patron (*kartṛ* or *yajamāna*), and artist (*śilpi*) – each with a part to play. It is not always precisely specified who does what: in translation, the impersonal 'one' is used to represent that mode. But, in general terms, it should be presumed that ritual is done by ritual practitioners and artwork is done by artists. Our interest here is largely in the instructions for the artist, which we will follow for a view into the materials and technological systems in play, and the rationale behind them, too. VAK chapter 17, at paragraph 25, stipulates that these artists must know the teachings for the procedures, that they must be versed in the tradition.

We will sometimes see the ritual officiant partake, at least in a token fashion, in the physical work done, and then hand it over to the artisans to complete. An example is seen at VAK chapter 17, paragraph 11, where, on the occasion of the felling of a tree from which the armature of the figure will be made, the officiant first makes cuts in the tree on four sides, then summons a wood-cutter to complete the felling. In redirecting the work to the artisans, the language of the text moves into a distinctive mode termed the causative, used to describe action that one makes somebody else do.

The patron pays for the entire procedure. We see payment happen at multiple points, as an example at VAK chapter 17 paragraph 13. In paying the practitioners, the patron ensures that the benefit from the procedure comes to him and not to them.

All the work, whether done by patron, ritual officiant or artist, must be done properly and without haste. This direction, too, is given on repeat, for example, again, at VAK chapter 17, paragraph 13.

The unbaked clay figural project embarked on by these participants belongs to tantric tradition. *Tantra*[2] begins in India and is exported from there, in Hindu, Buddhist, and Jain thought streams. There is material evidence of, and a textual record for, tantric temples in India from roughly the 5th century on. The earliest textual record describes minor shrines

2 The term *tantra* can serve as a label for a category of thought and behaviour. In its first usage, however, the word is a label for a category of text: one designed to hand on its tradition, from teacher to student, by initiation. As text referents, the terms *tantra* and *āgama* are used synonymously. Some texts call themselves *tantra*s; others call themselves *āgama*s; others call themselves both. Both terms refer to the transmission of information. That transmission teaches deity-centred practices, for liberation on the one hand, or, on the other hand, for worldly powers or rebirth in a heaven. Good accounts of *tantra* may be found here: Padoux 2017 gives a full account of Hindu *tantra*; Williams et al. 2012, in an overview of Buddhism in India, includes a chapter on Buddhist *tantra*; and White 2018 treats *tantra* broadly, including attention to Jain *tantra*.

perhaps intended for private esoteric ritual. Later texts present grander shrines clearly designed for public recognition and usage. However, despite the difference in scale, the essential purpose of both is the same: to serve as the domicile of the deity or deities within, and as the locus for their ritual service. The duty to house the deity being an ongoing one, maintained up to the present time, we see temples taking distinctive forms across place and time, from rock-cut cave temples to free-standing structural ones of evolving forms. Once constructed, the temple is consecrated. Then the deity may be installed within it, in iconic or aniconic form, and the deity is, in turn, consecrated. Thereafter, the deity must be attended to with daily ritual conducted by initiated officiants.

The images described in the VAK are created as the iconic forms into which the deity may be installed for worship. For this serious purpose, we will see a well-ordered presentation of a complex sequence of preparations for composite materials in a layered construction of seven principal strata: a wooden armature (*śūla*) assembled from individual wooden stakes which are also called *śūla* or sometimes *daṇḍa*; an 8-fold binding medium (*aṣṭabandha*); rope (*rajju*); clay composite (*mṛd*); limestone paste (*śarkarā*(*kalka*)); cloth (*paṭa*); and pigment (*varṇa*). Besides these seven principal materials, copper filets, pins, and gemstones are also used. All the materials are carefully chosen and prepared, and, in particular, the binding medium and clay are composites of many ingredients, with lengthy curing times. The text will speak for itself, but here are comments on the 7 component layers in sequence:

1. Wooden stakes (*śūla*, *daṇḍa*)

The VAK assigns a full chapter (chapter 17) to the formation of the stakes alone, packing all the other layers together into a single chapter (chapter 18). The wooden stakes form an armature skeleton as follows: The *mauli* stake is for the head, although not every text has a head stake separate from the spine one. The VAK gives it as an option. The spine (*vaṃśa*) stake runs vertically from the base of the spine to the top of the head. The chest (*vakṣaḥ*) stake lies horizontally across the upper chest. The hip (*kaṭi*) stake lies horizontally across the hips. The 2 thigh (*ūru*) stakes run from groin to knee. The 2 lower leg (*jaṅghā*) stakes run from knee to ankle. The 2 sole (*tala*) stakes run from heel to toes. The 2 upper arm (*bāhu*) stakes run from shoulder to elbow. The 2 lower arm (*prakoṣṭha*) stakes run from elbow to wrist. The 2 side (*pārśva*) stakes run down the two sides of the torso between the chest and hip stakes. The hands, fingers, toes and ears are made with copper strips (*tāmrapaṭṭa*).

To hold the stakes together, tenon (*śikhā* or *udaya*) and mortise (*avagāḍha*) joints (*sandhi*), pins (*kīla*), pegs (*dāru*), and more copper strips (*tāmrapaṭṭa*) are used. And to secure the finished statue, subsidiary stakes (*upaśūla*, *ādhāraśūla*, *ādhārabhitti*, *bhittiśūla*, or *phalaka*) attach the armature of the standing figure to the wall behind it, and the seated or recumbent figure to the seat or bed beneath it, see VAK chapter 18 paragraphs 16-20.

The way in which the armature is formed is fairly standardised across texts, with some minor variants. A noteworthy feature is the straight spine stake for a male deity, while that of female deities is curved to give a sway of the torso, see VAK chapter 17 paragraph 27. The female deities also do not have side stakes, as noted at VAK chapter 17 paragraph 26.

The spine stake is described in VAK chapter 17 paragraph 15 as being formed with a different cross section at each of three levels: square in cross section from penis to navel, octagonal from navel to throat, and circular from throat to crown of head.

The knee and elbow joints are less clearly explained in the VAK than at the KŚ and *Śilparatna* chapters on the stakes, where it is made clearer that the 4 *aṅgula*s of the knee are, in fact, made up of the bottom 2 *aṅgula*s of the thigh stake and the top 2 *aṅgula*s of the lower leg stake with a tenon and mortise joint between them, and the elbow joint is similarly made out of the elbow ends of the upper arm and lower arm.

As the stakes are being laid ready for assembly into a complete armature, the text, at chapter 18 paragraph 7, warns against crowding the stakes or mixing them up. They are to be marked in order to avoid the possibility of confusing them.

2. Eight-fold binding medium (*aṣṭabandha*)

The *aṣṭabandha* eight-fold binding medium coats the wooden armature. Its recipe is not discussed at all at the *Atrisaṃhitā*, *Kāmikāgama*, or *Kāśyapajñānakāṇḍa*. At the VAK and KŚ (and its close copy at the *Śilparatna*) it is presented with very similar ingredients, but in different proportions **[tab. 1]**.

Table 1 The recipe for 8-fold binding medium in the VAK and KŚ / *Śilparatna*

Ingredient of 8-fold binding medium (*aṣṭabandha*)	**Parts out of 24 in VAK chapter 18**	**Parts out of 24 in the KŚ / *Śilparatna* chapters on tying the ropes**
śrīveṣṭaka (resin of *Pinus longifolia*)	4	4
kunduraṣka (resin of olibanum)	5	3
guggulu (resin of bdellium)	1	5
guḍa, *guḷa* (molasses)	8	1
sarjaka (resin of *Vatica robusta*)	3	8
gairika (red ochre)	–	3
dhātucūrṇa (talc)	3	–

The above ingredients are mixed and ground, and cooked with sesame oil and ghee. At the KŚ (and *Śilparatna*), we are told that they are cooked until they have the consistency of honey.

3. Rope (*rajju*)

Ropes, made from coconut husk and grass, are wrapped around the *aṣṭabandha*-coated armature. From a practical point of view, this is done to bind them firmly, but we are told, too, that the wrapping is done in such a way as to map the patterns of the bodily vessels (*nāḍī* or *sirā*), running from

the navel and covering the body from head to foot. At the VAK, chapter 18 paragraph 29, the vessels are said to be 14 in number, and we are given minimal information about how they wrap the frame beyond the fact that there are two phases of wrapping, with a layer of cotton thread in between them. The KŚ (and *Śilparatna*) chapters on the ropes list many more vessels, naming each of them, and giving much more information on their patterning. Varma 1970 follows these latter instructions in his experiments.

4. Clay composite (*mṛd*)

Clay composite is applied next. The VAK describes the application as happening in two stages, with another wrapping of rope in between. The first application is described in chapter 18 paragraph 36 as being done using a *karaṇḍikā* basket tool rather than the hands. This ruling is not seen in other texts, and remains something of a puzzle. In a final step, gems are inserted into the clay at specific points across the limbs of the body, as described at paragraph 37.

The VAK gives a recipe for the clay composite that is thorough in terms of the ingredients and the substantial lengths of maturing time required, but not clear on amounts. So it is good to turn to other records in search of a more usable recipe. There is minimal information on the clay mix at *Atrisaṃhitā* and *Kāmikāgama*. At *Kāśyapajñānakāṇḍa* chapters 47 and 48, there is plentiful information but it, like that of the VAK, is not precise on ingredient amounts. More useable, as Varma noted, are the KŚ (and *Śilparatna*) chapters on the preparation of clay, which give a complete recipe with full precision around amounts of ingredients to be added, and textures to be obtained. Interestingly, in the KŚ (and *Śilparatna*) accounts, the dug earth from which the composite is made is referred to as *paṅka* rather than *mṛd*. Both words refer to earth or clay, but *paṅka* carries a more immediate meaning of mud, thus differentiating the earth base from the clay composite. And unlike other accounts, that of the KŚ (and *Śilparatna*) records the addition of coconut fibre to the mix before it is applied.

As to the ingredients given in the VAK, they are:

- the clay itself
- perfumed sand
- decoctions of the bark of *khadira* (*Acacia catechu* Willd.), and *kakubha* (*Terminalia arjuna*)
- decoctions of the bark of *aśvattha* (*Ficus religiosa*), *udumbara* (*Ficus glomerata*), *plakṣa* (*Ficus microcarpa* L.), and *nyagrodha* (*Ficus benghalensis* L.)
- water imbued with the three Myrobalan fruits (the fruits of *Terminalia chebula*, *Terminalia bellerica* and *Phyllanthus emblica*)
- powdered stone
- *śrīveṣṭaka* (the resin of *Pinus longifolia*)
- powdered barley corns (*yavasāra*), wheat (*godhūma*), and black gram (*māṣa*)
- resin of bdellium (*guggulu*), olibanum (*kunduruṣka*) and *sajjarasa* (*Vateria indica* L.)
- curd, honey, ghee, flax oil, sesame oil, and the juice of the fruit of the wood apple tree (*bilva*)
- powdered turmeric (*rajanī*)
- the three *kaṭuka* pungents (long pepper, black pepper and ginger)

- powdered extract of *kapittha* (*Feronia acidissima* L.); powdered yellow orpiment (*haritāḷa*), *koṣṭha* (*Saussurea lappa.* C.B.Clarke), ox-gall (*rocanā*), black sandal (*kṛṣṇa candana*), and *agaru* (*Aquilaria agallocha* Roxb., Aloe wood)
- powdered gold and silver
- banana fruit, coconut milk, and cow milk
- earth from a river, mountain, corn field, ant hill, or ocean, or the hole made by a crab, or dug up by the horn of an elephant or bull

5. Limestone paste

In translating *śarkarākalka* as limestone paste, the present account is following, and agreeing with, Varma (1970, 24-5), where he argues that this paste (*kalka*) is made from a gravel (*śarkarā*) that is, specifically, limestone. His argument for limestone is, in part, based on the term *ghaṭi*, that we sometimes see drawn into the name of the paste, as *ghaṭiśarkarā*. He works from a range of meanings of the root *ghaṭ* - "to connect, unite, form, shape"- that indicate a binding element. Following Varma, the present study understands the paste as a finer and paler clay, layered over the base clay to make a smooth surface for the application of pigment (Varma 1970, 105).

The VAK treats the limestone paste, but briefly. The *Atrisaṃhitā*, *Kāśyapajñānakāṇḍa*, and *Śilparatna* too, are curt. But then, there is not much to say as far as ingredients are concerned, there being only the limestone itself, washed, ground, and mixed with resins and water. The KŚ offers more in the way of a record of the viscosity one is looking for, and items admixed to the paste.

The materials given in the VAK for the limestone paste are:

- powdered limestone
- water imbued with the three Myrobalan fruits (the fruits of *Terminalia chebula*, *Terminalia bellerica* and *Phyllanthus emblica*)
- water decocted with the resin of *kapittha* (*Feronia acidissima* L.)
- cotton fibre

6. Cloth

Varma (1970), in his practical experiments, found the cloth layer to be essential, not only for the smooth surface it gave, but also to reinforce the joints of the armature. Made of cotton (*kārpāsa, ambara*), it covers the body. Over it goes another layer of limestone paste, then ornaments, then a layer of *mauktika* (pearl) clay is applied. This last is not further described but is, one takes it, named for its pale pearly colour, presumably good as a base layer beneath pigment ones. A final layer of limestone paste is added, too.

7. Pigment

Pigments are mixed with water containing extract of *kapittha* (*Feronia acidisssima* L.) as a binding medium, and applied with a brush (*tūlikā*), with gold in the final layer, bringing power (*śakti*) to the figure. The VAK offers only 4 basic colour choices: white, golden, dark, and black. In the KŚ on the other hand, there are 3 full chapters on colours, the source materials for them, and how to mix and apply them, in 6 layers, each with a different brush

action – from a full stroke to the finest dots – and each with less binding medium than the last.

As the VAK notes in chapter 17 paragraph 29, referring back to a fuller discussion in chapter 15, the completed figure is installed in the innermost chamber of the temple in a position determined within a grid of parts laid over the floor of the temple. The positioning of a permanently installed, immobile, image is done with a grid of 7 by 7 parts, whereas for a temporary, mobile, image it is done in a grid of 16 by 16.

The preparation and application of each of the seven layers for that completed figure (stakes, binding medium, rope, clay, limestone paste, cloth, and pigment) is accompanied by ritual action and attention, vocalised in *mantra* form. The layers are more than just useful material substrates. VAK chapter 17 paragraph 30 equates the seven principal layers of terracruda construction with layers of the body: the stake is bone, the binding medium is fat, the rope is the vessels of the body (*nāḍī* or *sirā*), the clay is flesh, the limestone paste is blood, the cloth is skin, and the pigment is vitality, life (*jīva*). Such an equation of materials with bodily organs aligns with the actual creation of a being rather than its mere representation - a created being that will be animated by means of pigment and ritual, and a living being that should not be baked.

Our examination of this layered account of the procedure naturally leads one to consider how the text, and the body of literature that it represents, can inform the interpretation of terracruda practice across time, place and culture. The host text for this account, the VAK, is a *Vaikhānasa Vaiṣṇava* ritual account from South India. That might seem to be an oddly dislocated record, given that the sculptural production under archaeological study is largely Buddhist and Central Asian. But it is also a tantric text, part of a thought-line of *Tantra* that runs through not just this one *Vaikhānasa Vaiṣṇava* tradition, but also through the wider *Vaiṣṇava*, *Śaiva*, Jain and Buddhist worlds. *Tantra* is (as its name avers) a connecting thread of continuity. This continuity of ideas, handed on over time, place, and tradition, is surely a bridge between a set of instructions held in a *Vaikhānasa* text from South India and sculptural production in Buddhist contexts all along the silk route. One can understand this transmission of technological instruction to have followed a Tantric thought route that is the ideational companion of that physical silk route, filling the apparent geographical and religious gap between textual instruction and surviving material traditions. For a vision into the ways in which the ideas of *Tantra* could have travelled, see the account of textual transmission along the silk route in Wen (2023, 73-76).

At the same time, the VAK itself calls for caution: in chapters 74 and 77, it warns of the dangers of crossing ritual traditions. In comparing this text with *Śaiva* parallels, and in using it to understand the production of Buddhist figures, we will need to be aware of its own *Vaikhānasa* context, even as we conceive of it as part of a broader transmission and transformation of technological knowledge across regions and traditions. With that caution in mind, though, we can benefit from the richnesses offered by a cross-traditional and cross-regional transmission of terracruda technology.

The VAK is also cautious in regard to any possible error in procedure. Towards the end of its account of the entirety of procedure for worship in a temple, the text, in chapter 64, gives the rules for remediation in the case of error in procedure. Having, in chapters 17 and 18, detailed what should be done to make an unbaked clay image, VAK chapter 64, in listing the possible

failures in the procedure, recaps the steps in the technique, giving us one last insight into anxieties over error:

> *beroktaśūlānāṃ pratyekaṃ taduktamānadvitricatuṣpañcaṣaḍyavamānaṃ hīnaṃ cet, tāmreṇa saṃpūrṇaṃ kṛtvā vaiṣṇavaṃ puruṣasūktaṃ dadbhyaḥ svāhety aṃgahomaṃ ca hutvā punar ārabhet*
>
> If, for any of the stakes taught for the image, the size of the stake is 2, 3, 4, 5, or 6 *yava*s less than that taught, one should fill the gap with copper, and having offered a *Vaiṣṇava*, a *Puruṣasūkta*, '*dadbhyaḥ svāhā*' and an *aṅgahoma*, one may proceed.
>
> *snehadravyacūrṇakaṣāyauṣadhiṣu hīneṣu prayogaviparyāseṣu ca rajjub andhāṣṭabandhamṛdālepanaghaṭīśarkarālepanapaṭāchādanābharaṇādiṣu kramahīneṣu varṇavyatikrame ca vaiṣṇavaṃ brāhmaṃ aiṃdram āgneyaṃ mahābhūtadevatyaṃ prājāpatyaṃ ca vyāhṛtyantaṃ hutvā yathāvidhi yathāsthāne krameṇa kārayet*
>
> If oils, powders, astringents or herbs are lacking, or there is an error in mixing, or there is a deficiency in the binding of the ropes, the binding medium, the anointing with clay, or the anointing with limestone paste, the covering in cloths, the adornments, etc., or a fault in the pigments, one should offer a *Vaiṣṇava*, *Brāhma*, *Aindra*, *Āgneya*, *Mahābhūtadevatya*, and *Prājāpatya* ending with *vyāhṛti*, then make it properly in due sequence according to the situation.

So, errors may be corrected. We learn, too, that while such rectitude may come first, beauty is also attended to. As an example, *Kāśyapajñānakāṇḍa* chapter 49 advises that the finished figure should delight the mind:

> *tataḥ śilpī bhagavantaṃ dhyātvā mūrdhādi pādaparyantaṃ krameṇa bhaktyā yuktyā tattaccharīre krameṇa yāvat dravyaṃ manoharaṃ budhyāhlādakaraṃ śāntikādyujjvalitaṃ kārayet*
>
> After that the artist should meditate on the Lord and have the parts of the body rendered, from head to foot in turn, with devotion and rectitude, so that the material is charming, pleasing to the mind, appeasing, and gleaming.

It is nice to end by noting that, for all their dry and procedural style, the texts that direct terracruda production also call for it to be beautiful.

5 Links to the Edition and Translation

Please turn to Zenodo `https://doi.org/10.5281/zenodo.23272304` for the edition in Roman characters and English translation of VAK chapters 17 and 18. The edition is, at base, a transliteration into Roman characters of the 1926 Madras edition with some emendments marked in the footnotes.

In a step away from the textual tradition, the edition and translation are divided into numbered paragraphs for referencing purposes.

6 Ramifications

Rather than draw this account together into a conclusion, this final paragraph will consider what could grow out of it. It is hoped that an eased access to the VAK will make it a useful resource, for both those who work on texts and those who work with materials. While old, the text, being highly practical, lends itself to adoption for practical purpose today. Its way of thinking about terracruda, the words used to describe it, too, can be useful, as we think about and discuss terracruda in the present.

A further line of research concerns the experimental reconstruction of the recipes for the *aṣṭabandha* wood varnish, clay-based composites, and limestone paste, in order to assess the properties and practical behaviour of the resulting materials. This work is already underway for the TANTRiC project (Traditional Knowledge for the Conservation of the Silk Roads Monumental Terracruda Sculptures), a Marie Skłodowska-Curie Actions Postdoctoral Fellowship funded by the European Union under Horizon Europe (Grant agreement No. 101105953).

Comparison between the materials produced according to these textual recipes and the technological evidence documented archaeologically may also provide further insight into the relationship between prescribed practice and material execution.

This author will continue to examine known textual sources related to unbaked clay technology, beginning with the KŚ, while also seeking additional relevant texts. Further references or suggestions concerning such sources would be welcome.

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