

Clarifications to queries on *Śulbasūtras*

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This document is a compiled set of clarifications to various queries pertaining to *Śulbasūtras* that were posed by Prof. Manjul Bhargava, Princeton University, to Prof. K. Ramasubramanian, IIT Bombay. The sections are named thematically to present various clarifications.

1 Clarifications on the name and spelling of *Śulbasūtras*

1.1 Textual evidences to show it is “*Śulba*” and not “*Śulva*”

There has been considerable confusion among scholars regarding the name of these class of texts which have been composed primarily to assist the *purohitas* (*advaryu*, etc.) with construction of the *vedic* altars. Specifically the doubt arises with the spelling to be used:

Should we write the name of the text as *Śulbasūtra* (शुल्बसूत्र) or *Śulvasūtra* (शुल्वसूत्र)?

As far as the *purohitas* who are till date performing *yāgas* are concerned, and particularly those who are well versed and can read these texts in original in Sanskrit, they do not have any kind of confusion regarding how the text has to be referred to. This is simply because of the fact that the word शुल्ब appears in the texts themselves in a few places. For instance, in the बोधायनश्रौतसूत्र quoted below (see Figure 1) we find the word शुल्ब appearing in two places (1.5.12 and 1.6.1):

The word शुल्ब appears not only in the *Śrautasūtras* but in the *Śulbasūtras* themselves.¹ For example in the *Maitrāyaṇīya-śulbasūtra* while describing the nature of the cords, particularly their structure, as well the material from which they have to be prepared, we find the following verse:

मौञ्जं शुल्बं सदा कार्यं शाणेन परिमिश्रितम् ।

मन्वादयो वदन्त्येवं मिश्रितं कुशबल्बजैः ॥

(*Maitrāyaṇīya* 4.3)

¹It may be noted that both *Śrautasūtras* and *Śulbasūtras* form a part of what are referred to as the *Kalpasūtras*. In fact, we also find texts wherein the latter forms a part of the former.

निधान्याच्छेदनी संनहनीति यथालिङ्गम् ५ खादिरं पालाशं वैकविंशति-
 दारुमिध्मं करोति ६ त्रयः परिधयः ७ पलाशकार्पर्यखदिरोदुम्बरबि-
 ल्वरोहीतकविकङ्कतानां ये वा यज्ञिया वृक्षाः ८ आर्द्राः शुष्का वा सत्व-
 क्काः ९ स्तविष्टो मध्यमोऽग्नीयान्द्राघीयान्दक्षिणाध्वोऽग्निष्टो हसिष्ठ उत्त-
 राध्व्यः १० द्वे आघारसमिधावनूयाजसमिदेकविंशीति ११ समूलानामृते-
 मूलानां वा दर्भाणां पूर्ववच्छुल्बं कृत्वोदगग्रं वितत्य १२
 इति पञ्चमी कण्डिका

यत्कृष्णो रूपं कृत्वा प्राविशस्त्वं वनस्पतीन् । ततस्त्वामेकविंशतिधा
 संभरामि सुसंभृता । त्रीन्परिधीं स्तिस्रः समिधो यज्ञायुरनुसंचरान् । उ-
 पवेषं मेक्षणं धृष्टिं संभरामि सुसंभृतेति शुल्ब इध्मं संभरति १ कृष्णो

Figure 1: *Bodhayana-sulbasūtras* containing the word *sulba*.

1.2 The source of confusion?

While most of the Sanskrit source works only use the form शुल्ब, some of the texts dealing with *Śulbasūtras*, in English use the form *Śulvasūtra* in Roman script. For instance, the extract from the work of G. Thibaut, printed 1875 (see Figure 2), clearly indicates the use of the form शुल्ब instead of शुल्ब।

We have no clue as to where from Thibaut got to understand the verbal form as शुल्ब-माने instead of शुल्ब-माने । Perhaps the confusion that he had in the form of the verbal root, would have led him to use the form शुल्ब even in the title page instead of शुल्ब while naming the text. That said, there are a couple of more interesting things that are worth noting in the paragraph cited in Figure 2.

1. Thibaut while referring to the work of the famous astronomer Bhāskara of the twelfth century, calls it as *Vijagaṇita* rather than *Bijagaṇita*.
2. Thibaut also mentions that he could not find any *sūtras* making ‘use of the term “*śulva*”; a cord is regularly called by them “*raju*”’.

Based on the quotations we have provided in the previous section from the *Śrautasūtras* and the *Śulbasūtras*, it should be evident to the readers that Thibaut is completely mistaken in making the following assertive statement:

I may remark at once that the *sūtras* themselves do not make use of the term “*śulva*”; a cord

While therefore unable positively to assert that the treasure of mathematical knowledge contained in the *Lilāvati*, the *Vījagaṇita*, and similar treatises, has been accumulated by the Indians without the aid of foreign nations, we must search whether there are not any traces left pointing to a purely Indian origin of these sciences. And such traces we find in a class of writings, commonly called *S’ulvasūtras*, that means “sūtras of the cord,” which prove that the earliest geometrical and mathematical investigations among the Indians arose from certain requirements of their sacrifices. “*S’ulvasūtras*” is the name given to those portions or supplements of the *Kalpasūtras*, which treat of the measurement and construction of the different vedis, or altars, the word “*s’ulva*” referring to the cords which were employed for those measurements. (I may remark at once that the sūtras themselves do not make use of the term “*s’ulva*”; a cord is regularly called by them “*rajju*”.) It appears that a *s’ulva-adhyāya* or, *pras’na* or, instead of that, a *s’ulvapariśiṣṭa* belonged to all *Kalpasūtras*. Among the treatises belonging to this class which are known to me, the two most important are the *S’ulvasūtras* of *Baudhāyana* and of *A’pastamba*. The former, entitled to the

Figure 2: Excerpts from the article authored by Thibaut.

Given the fact that Thibaut would not have had access to all the existing literature on the *Śulbasūtras*, one would have appreciated him making a tentative statement, rather than being quite assertive with reference to the use of the word शुल्ब in the *sūtra* literature. It is also surprising to note Thibaut’s use of the word *Vījagaṇita* to refer to the work of Bhāskaraċārya, which is so widely known as *Bijagaṇita* throughout the Sanskrit literature.

Suspecting that there could be some precedence for this usage, I looked into the earlier work by HT Colebrooke. In his dissertation (for instance, see page 4), he refers to Bhāskara’s work with the same spelling as Thibaut. Obviously, there should have been a serious confusion at some stage for these scholars to commit this mistake, since starting from the Vedic literature, to the *Nirukta* literature, to various *Kośas*, to the classical Sanskrit literary works, we find the word बीज appearing multiple times in various contexts and not वीज!

Furthermore, Bhāskara himself in the invocatory verse of his text *Bijagaṇita*, employs the word बीज। So, the question as to why these Western indologists, starting with Colebrooke, chose to write the name of the text as *Vījagaṇita*, was quite puzzling to me and apparently seemed to be shrouded in mystery. Naturally, the path of Colebrooke would have been faithfully followed by Thibaut. Curious to know what should have went wrong, and with the confidence that it should not be too difficult to fathom the reason behind this confusion, I started looking at the life of Colebrooke – who is acknowledged to be the “father of British

Indology” – and this luckily provided the key to the mystery!

Henry Thomas Colebrooke, born in 1765, came to India in 1782. His arrival in India was because of the posting that was given to him as a ‘writer’ in the East India Company. His first appointment on arrival was in Calcutta, where he spent about four years before getting posted elsewhere. After spending about 15 years in other places, in 1801, he was once again posted in Calcutta, but now as the judge of a new court. He spent the next 14 years in Calcutta, before returning to England in 1815. Thus of the 33 years that Colebrooke had spent in India, more than 18 years was in Bengal. This is sufficiently large period for him to learn and master the Bengali language as well as its script. It is highly probable that Colebrooke would have learned how to read and write in the Bengali script soon after his arrival in India in 1782 as a young boy who was hardly 17 years old.

In Bengali alphabets, as shown in the tables below, it may be noted that the script for denoting the sound ‘ba’ and ‘va’ are one and the same.

অ	আ	ই	ঈ	উ	ঊ	ঋ
এ	ঐ	ও	ঔ	অঃ	ঊঃ	
ক	খ	গ	ঘ	ঙ		
চ	ছ	জ	ঝ	ঞ		
ট	ঠ	ড	ঢ	ণ		
ত	থ	দ	ধ	ন		
প	ফ	ব	ভ	ম		
য	র	ল	ব			
শ	ষ	স	হ			
সা	সা	সা	হা			

(a)

বাংলা বর্ণমালা					
স্বরবর্ণ					
অ	আ	ই	ঈ	উ	ঊ
ঋ	ঌ	এ	ঐ	ও	ঔ
ব্যঞ্জনবর্ণ					
ক	খ	গ	ঘ	ঙ	চ
ছ	জ	ঝ	ঞ	ট	ঠ
ড	ঢ	ণ	ত	থ	দ
ধ	ন	প	ফ	ব	ভ
ম	য	র	ল	ব	শ
ষ	স	হ	ড়	ঢ়	য়
	ৎ	ঃ	ঃ	ঃ	

(b)

Figure 3: Bengali script tabulated, as taught in schools today.

In Figure 3(a), the script appearing in the third column in the 7th row denotes the alphabet ‘ba’, whereas the one appearing in the fourth column in the 8th row denotes the alphabet ‘va’. As seen they are simply undistinguishable.² This is all the more evident from the header

²However, the author of this note is informed by Swami Atmapriyananda (over telephonic conversation he had on June 29, 2021) that to maintain distinction between the two letters, some monks – in the Ramakrishna Mutt order, well-versed in Sanskrit – used to insert a very small line (something akin to notation that we use for denoting angle) inside the letter ‘va’ to distinguish it from ‘ba’.

in Figure 3(b), where the beginning letters of the two words are supposed to be ‘ba’ and ‘va’ respectively. This perhaps explains why the Western scholars like Colebrooke started writing *Bijagaṇita* as *Vijagaṇita*, and *Śulbasūtras* as *Śulvasūtras*.

1.3 The right moniker for attributing a collective noun for these texts

Here we briefly present some clarification with regard to how to refer to the texts collectively. Should the name be written in its plural form or singular form? To address this question, it may be better to start with the word सूत्र itself. It is primarily used in two senses (thread and aphorism), both of which stem from the same verb सूत्र (= वेष्टने) which essentially denotes ‘tying’. Since it is a neuter gender word, the plural form of the word will be सूत्राणि।

However, there is a maxim that is oft quoted by scholars which goes as – “जात्येकवचनम्”। This is used by teachers on various occasions to explain the use of the singular form to refer to entities that are understood in the plural form, from the context. For example in the second half of the following verse in *Bhagavadgītā* (7.16),

चतुर्विधा भजन्ते मां जनाः सुकृतिनोऽर्जुन ।
आर्तो जिज्ञासुरर्थार्थी ज्ञानी च भरतर्षभ ॥

we find a class of people referred in the singular form. From the context it is quite clear that the terms employed here refer to a class of people and not individuals though the usage is in singular form. One can find several such examples in the literature, and thus both forms शुल्बसूत्रम् and शुल्बसूत्राणि are valid and either of them can be used, if the title is going to be given in Devanāgarī.

However, if the title is going to be represented in Roman transliterated form, then since such a convention has not been established, I would recommend the use of plural *Śulbasūtra-s* which corresponds to शुल्बसूत्राणि in Devanāgarī. Incidentally while writing Sanskrit words in transliterated form, there has been an established convention of dropping the suffix and retaining only the base forms while denoting the word in singular. As far as Sanskrit is concerned, we do not drop the suffixes, and in fact, we declare it a word (पद) only if it has a suffix added to it. It is said –

सुप्तिङन्तं पदम् ।

That which ends with सुप् [suffixes added to nouns] or with तिङ् [suffixes fixed to verbs] is considered as a [proper] word [that can be employed in a sentence].

2 Extant *Śulbasūtras* and their authors

2.1 List of the known *Śulbasūtras*

Regarding the number of *Śulbasūtras*, so far eight different *Śulbasūtra* texts have been identified by scholars. They are:

1. *Baudhāyana-śulbasūtra*
2. *Āpastamba-śulbasūtra*
3. *Kātyāyana-śulbasūtra*
4. *Mānava-śulbasūtra*,
5. *Maitrāyaṇa-śulbasūtra*
6. *Vāraha-śulbasūtra* and
7. *Vādhūla-śulbasūtra*
8. *Hiraṇyakeśi-śulbasūtra*

Of them, the *Bodhāyana-śulbasūtra* is considered to be the most ancient one.³ It also presents a very systematic and detailed treatment of several topics that are skipped in later texts. It is made up of three chapters constituting about 520 *sūtras* (113 + 83 + 323). Since Bodhāyana presents things quite elaborately, and at times even illustrates the rule with numerical examples, some interesting epithets such as प्रवचनकार (lit. ‘one who engages in giving discourse’) have been used to describe him.

Some of the *Śulbasūtra* texts, for example, the 5th and the 8th one listed above, primarily deal with the procedures pertaining to the construction of altars, how to prepare the rope (*rajju* or *śulba*), what material is to be used in its preparation to ensure it does not stretch itself while making measurements, while still remaining thin, strong, uniform, etc. Such texts mainly serve as manuals for construction, and do not have much discussion explicitly on various mathematical aspects.⁴

³Scholars place it somewhere around 800 BCE. This assessment is based upon the style, completeness, and certain ‘archaic’ usages that are not that frequently found in later texts. It is also based upon the fact that the commentators of various *Kalpasūtras* while paying respect to the tradition, commence with the name Bodhāyana, and then list other names such as Kātyāyana and so on.

⁴This should not give the reader an impression that they are short treatises. For instance, the 8th text listed has about 445 verses.

2.2 The reputation enjoyed by Bodhāyana and his works

Besides being the most ancient, the work of Bodhāyana has also been considered quite authoritative. For instance, the great prolific writer Sāyaṇācārya (c. 14th century) in his introduction to the commentary on the *Taittirīya-saṃhitā*, generally referred to as the *Vedabhāṣya*, notes:

बोधायनादिसूत्रोदाहरणपूर्वकं ब्राह्मणानुसारेण मन्त्रार्थं योजयामः।

By citing the Bodhāyana-sūtras [as scriptural authority], ...

The other commentator on the *Taittirīya* recension, namely Bhaṭṭabhāskara Miśra (c. 11th century?) paying his tribute to Bodhāyana at the beginning of his introduction writes:

प्रणम्य शिरसाचार्यान् बोधायनपुरस्सरान् ।

व्याख्यैषाध्वर्युवेदस्य यथाबुद्धिं विधीयते ॥

Having offered my salutations to the preceptors beginning with Bodhāyana, I undertake to write this commentary of *Yajurveda*, ...

The above quotations, particularly the phrase बोधायनपुरस्सरान् employed in the previous verse, clearly points to two things with regard to Bodhāyana. (i) प्राचीनतमः – that he has been the earliest among the various authors of the *Kalpasūtras* and (ii) पूज्यतमः – that he was foremost among those who enjoyed the reputation of the later scholars .

2.3 Authors of *Śulbasūtra* texts

The titles of the *Śulbasūtra* texts given in the previous section, though are clearly connected with the names of their authors, not all of them really capture the authors' names in their original form. The first part of the titles (the portion before the hyphen) in some of them are actually formed by adding a 'taddhita' suffix to the names of the authors of these texts.

There are several *taddhita* suffixes employed in the literature to convey a variety of meanings, and they have been extensively discussed by Pāṇini. The ones that are relevant to our present discussion appear in the 4th *Adhyāya*. More specifically the suffix employed in this context of naming the text after its author is given by the following *sūtra*:

कृते ग्रन्थे (4.3.116)

With reference to the text authored.

By supplying the word तेन from an earlier *sūtra* (4.3.112), the above *sūtra* essentially tells that a suffix अण् gets tagged to the noun, and thereby the resulting word gives the meaning that “the text has been authored by the person referred to by that noun”.⁵ Thus the word,

⁵In fact, this suffix gets affixed by making a really long jump from the *sūtra* प्राग्दीव्यतोऽण् (4.1.83) appearing in the first *pāda* of the fourth chapter.

बोधायन + अण् = बौधायन,

refers to the work that has been authored by Bodhāyana. It may be noted that this suffix has modified the form of the first vowel appearing in the noun बोधायन। This modification is technically referred to as आदिवृद्धि। Other forms of changes also occur in the word and this happens in various ways in various words. For example, the names of the sages भरद्वाज and अत्रि would take the form भारद्वाज and आत्रेय⁶।

That said, the names of the authors of the first four *Śulbasūtras* enumerated in the previous section are:

1. बोधायन – Bodhāyana
2. आपस्तम्ब – Āpastamba
3. कात्यायन – Kātyāyana
4. मनु – Manu

This is how the names have to be written, if they are going to be represented in Roman script. If they are going to be written in Devanāgarī, then there should be a विसर्ग appended to all the above names as shown below.

बोधायनः, आपस्तम्बः, कात्यायनः, मनुः

Of the four names listed above, in the case of the second and the third names, the suffix अण् cannot be added to them. This is because in these cases, the first vowel in the word itself is in what is technically known as वृद्ध form.⁷ In such cases, some other *sūtra* which prescribes a suffix 'cha' will become operative in order to convey the meaning “that which is composed by” or “that which belongs to” and so on. Naturally the resulting form the the word will also be different.

आपस्तम्ब + छः = आपस्तम्बीय,
कात्यायन + छः = कात्यायनीय

The above forms may sound similar to the more familiar words like पाणिनीय, आर्यभटीय, and so on. More details about this will be discussed in the following sections.

⁶These words are generally familiar to Indians, and are commonly used while referring to the *gotras* (the lineage) in which they come. It has also become fashionable to add these names as surnames nowadays.

⁷One of the *sūtras* that define वृद्धसंज्ञा is – वृद्धिर्यस्याचामादिस्तद्वृद्धम् (१.१.७३); The meaning of the *sūtrasūtra* is straightforward – प्रयुक्ते शब्दे प्रथमः स्वरः 'वृद्धि'संज्ञकः भवति (इत्युक्ते, आकारः / ऐकारः / औकारः अस्ति) वेत्, सः शब्दः 'वृद्ध' इति संज्ञां प्राप्नोति।

Now we move on to address a specific question that bothers many scholars. Some authors of recent times, who have extensively written on *Śulbasūtras* refer the name to the name of the author of *Baudhāyana-śulbasūtra* to be Baudhāyana, and not Bodhāyana.⁸ Whereas certain other scholars give the name as Bodhāyana. How are we to know which is the correct form of the name?

This is indeed a genuine and valid question, as there is a possibility of such a confusion. Purely from a grammatical view point, the question cannot be resolved, as the possibility of the name of the author being Baudhāyana cannot be ruled out. However, there are other considerations, that strictly prohibit us from accepting the name of the author to be Baudhāyana. We shall address this question in some detail in the following section. As we discuss the case of Bodhāyana, we shall also consider the other three names Āpastamba, Kātyāyana and Mānava one after the other sequentially.

2.4 Justification in identifying the names of the authors

Before providing evidence as to why the names of the authors of the first four *Śulbasūtra* texts have to be taken the way we have stated in the previous section, a few general remarks pertaining to this problem in a much larger context may not be out of place. As far as Sanskrit literature is concerned, it is only in a very few texts that we find the name of the author mentioned in the text itself.⁹ In some cases we find the commentators providing some information about the author. In other instances, we find the name of the author mentioned in colophons.

There are also instances in which we find the name only on the case of the bundle carrying the manuscript. While this is the general trend, very rarely we also come across texts in which the authors themselves state their names, their family details, name of their teacher, the place in which they lived, the date of commencement of the work, its completion and so on. It may also be added here that even this trend of providing a little information — about themselves or their lineage, which could be some times in an indirect or subtle form — can be seen only in the later period, and certainly not during the period of composition of various *sūtra* texts (around or prior to 500 BCE).

2.4.1 Bodhāyana

It was mentioned earlier that the *taddhita* suffix ऋत् has been used to indicate that the work was composed by the author to whose name this suffix is tagged. The same suffix can also be

⁸See for instance, the text on *Śulbasūtras* brought out by SN Sen and AK Bag (Pub: Indian National Science Academy, New Delhi, 1983, p. 2).

⁹Generally it would be somewhere at the beginning (like in the *Āryabhaṭīya*), or at the end of the text (as in *Siddhāntasiromaṇi* of Bhāskarācārya) or in the colophon.

used to refer to certain other meanings such as:

1. 'The offspring of a person' as licenced by the *sūtra* तस्यापत्यम् (4.1.92)
2. 'Entity belonging to a person' as licenced by the *sūtra* तस्येदम् (4.3.120)

Considering the first of the above two meanings one could indeed ask, how do we know that the author was not a descendant of Bodhāyana and thus called Baudhāyana? Furthermore, the form Baudhāyana can refer to either the direct descendant or a distant descendant. Hence, purely based on the grammatical derivation of the word, the issue cannot be decided.

Fortunately, we have other solid evidences to show that the author is Bodhāyana himself, and not his near or far descendant who may be referred to as Baudhāyana. We have many references to the name Bodhāyana appearing in various manuals connected with house-hold vedic rituals, wherein the priests while uttering the *saṅkalpa* make the main performer (*yajamāna*) of the ritual mention:

... बोधायनोक्तप्रकारेण करिष्ये ।

I shall perform the ritual ...as prescribed by Bodhāyana.

In the above phrase, which alludes to the author of the text, we find the word Bodhāyana appearing and NOT Baudhāyana. In yet another work (see Figure 4), again a *prayoga* manual printed in Grantha script, we find the name of the author written as Bodhāyana. What is found at the end of the quote:

iti bodhāyanah ||

Thus [spake] Bodhāyana.

* 'ஐந்நக்ஷத்ரு வுண்ணு நக்ஷத்ரு விவாஹயளனொ
வநயந ஸஜாவதந்நாழ்யாயபாஹிஷு சுநெஷு ஶஜைகா
யெஷு ஶுஷொவராஹெ ஶுஷொதாதெவா சிவாஹு
வதுஷாஹுவா ஹயம் விநெதாஶஸாநிஸாரஹெத' உதி ஶொ
யாயநஃ ||

Figure 4: Quotation from a *prayoga* book in Grantha script

Statements such as the above, found in the works related to '*śrauta-smārta-prayoga*' help us in resolving the doubt unambiguously. These *prayogas* would have been in vogue at least

for several hundreds of years. In yet another such manual printed towards the latter half of the previous century, in 1970, titled *Brahma-karma-samuccaya*, I found the following interesting passage towards the end of the introduction. It essentially conveys that referring to the author as Baudhāyana — as found in some printed volumes — is simply a mistake (*prāmādikā*)!

बोधायनीयाः सर्वे स्मार्तविधयोऽस्मिन् ब्रह्मकर्मसमुच्चये प्रथममेव मुद्राप्यन्ते । महर्षिर्बोधायनः प्रवचनकारः, तेन विरचितं बोधायनं बोधायनीयं वेति वक्तव्यमिति प्राचीना परम्परा । एवं सति केषुचन मुद्रितेषु ग्रन्थेषु ‘बोधायन’ इति नाम्ना महर्षेर्व्यवहारः कृतो दृश्यते, स सर्वथा प्रामादिकः । अस्मिन् ग्रन्थे सर्वत्र ‘बोधायन’ इत्येव आचार्यवाची शब्दप्रयोगः कृत इति सर्वथा समुचितमेव । इत उत्तरं सर्वत्र बोधायन इति यथार्थपदेनैव आचार्यस्य निर्देशो भवेदित्याशास्महे ।

Finally, the word बोधायनीयं appearing in the above quotation, is equivalent to the word बोधायनं in its meaning, and both these words refer to “the work/ composition of Bodhāyana” in the current context.¹⁰

2.4.2 Āpastamba

Here again, one can ask — why is it not possible that the author’s name was अपस्तम्ब, which turns into the form आपस्तम्ब by adding the *taddhita* suffix अण्? It is indeed possible that the author’s name could be अपस्तम्ब to which adding the suffix, one could get the word आपस्तम्ब । This is a perfectly valid argument from a grammatical view point. However, other usages found in the scriptures prohibit us from accepting this argument. Firstly, we do not find the name अपस्तम्ब occurring anywhere in the literature. Secondly, we find citations giving the name आपस्तम्ब as such. For instance, in the *Brahmasūtra-bhāṣya* of Ādi Śaṅkarācārya we find the following statement:

स्मरति हि आपस्तम्बः — ‘तद्यथा आम्रे फलार्थे निमित्ते छायागन्धावनूत्पद्येते एवं धर्मं चर्यमाणम् अर्था अनूत्पद्यन्ते’ (आ. ध. सू. १ । ७ । २० । ३) इति ।

This is convincing enough to argue that calling the name of the author as अपस्तम्ब would be certainly inappropriate, if not crass.

¹⁰The word बोधायनीय appearing in the quotation above, rings similar to the words पाणिनीय, आर्यभटीय and so on. However, if one were to explain the derivation of the former we need to invoke a *vārtika*—one more step involved—before applying a certain Pāṇinan rule. While the latter words are obtained by applying a suffix ‘cha’ to the nouns as per the *sūtra*, वृद्धाच्छः (4.2.114), in the case of the former, we need to invoke the *vārtika* “वा नामधेयस्य वृद्धसंज्ञा वक्तव्या” in order to realise that even to the noun Bodhāyana one could apply the said rule. Once we do that, the word Bodhāyana which did not have वृद्धसंज्ञा before gains that, and hence becomes eligible for applying the वृद्धाच्छः and the form बोधायनीयं gets explained.

2.4.3 Kātyāyana

Settling whether Kātyāyana is a proper noun is somewhat a tricky issue, and hence needs a bit more elaborate discussion. As earlier, in the case of *Kātyāyana-śulbasūtra* too, one could have a similar doubt regarding the name of the author.

1. Could it be Kātyāyana from which the word Kātyāyana has been derived, akin to the modification Bodhāyana → Baudhāyana?
2. Or, could Kātyāyana itself be the 'proper' name of the author of the text?

A strong No to proposition 1, because firstly, unlike the Bodhāyana case, we do not have any literary evidence to show that there was a person by the name Kātyāyana, in which case one could say by adding the *taddhita* suffix अण् Kātyāyana → Kātyāyana. Secondly, we find only the word Kātyāyana appearing in all the instances through out the literature. Hence proposition 1 does not hold.

And a weak No to the proposition 2 also because there are literary evidences that point to the fact that the word Kātyāyana is used as a certain epithet to refer to the lineage not as a 'proper' noun like 'Dittha' or 'Dabittha' or 'Tom' or 'Robin' that is given to a person. We provide below a few examples from the literature, starting from the Vedic corpus, where the word Kātyāyana or for instance Kātyāyanī (in its feminine form) appears:

Example 1: In the *Praśnopaniṣad*, which is one of the ten principal *Upaniṣads*, the first *mantra*, begins with an episode wherein it is said that a few seekers of knowledge, with a great appetite to gain the supreme knowledge of Brahman, approach a highly reputed and saintly person Pippalāda. The *mantra* along with Śaṅkara Bhagavatpāda's commentary is as follows:

सुकेशा च भारद्वाजः शैब्यश्च सत्यकामः सौर्यायणी च गार्ग्यः कौसल्यश्चाश्वलायनो भार्गवो
वैदर्भिः कबन्धी कात्यायनः ते हैते ब्रह्मपरा ब्रह्मनिष्ठाः परं ब्रह्म अन्वेषमाणाः एष ह वै तत्सर्वं
वक्ष्यतीति ते ह समित्पाणयो भगवन्तं पिप्पलादमुपसन्नाः ॥ १ ॥

सुकेशा च नामतः, भारद्वाजस्यापत्यं भारद्वाजः । शैब्यश्च शिबेरपत्यं शैब्यः, सत्यकामो नामतः । सौर्यायणी
सूर्यस्यापत्यं सौर्यः, तस्यापत्यं सौर्यायणिः ; छान्दसं सौर्यायणीति ; गार्ग्यः गर्गगोत्रोत्पन्नः । कौसल्यश्च
नामतः, अश्वलस्यापत्यमाश्वलायनः । भार्गवः भृगोर्गोत्रापत्यं भार्गवः, वैदर्भिः विदर्भेषु भवः । कबन्धी
नामतः, कत्यस्यापत्यं¹¹ कात्यायनः ; विद्यमानः प्रपितामहो यस्य सः ; युवप्रत्ययः ।

¹¹It seems there is a typo here in all the printed version of the text. As per Pāṇinian grammar, the word should be कात्यस्यापत्यम् । This is because, the word कत → कात्य, when we apply the suffix यञ् as per the rule गर्गादिभ्यो यञ् (4.1.105). This rule demands आदिवृद्धि in the noun and hence we get the form कात्य । Application of some other rule to get the form कत्य from कत also does not make much sense, since the name of the sage कत has been explicitly listed under the group of names commencing with Garga (गर्गादिगण) ।

Here the names of the six seekers of knowledge who went to Pippalāda are listed. Along with each name, another qualifier or epithet is tagged that provides more information about their lineage. The names are: Sukeśa, Śaibya, Sauryāyaṇi, Kausalya, Vaidarbhi¹² and Kabandhī. Of the various epithets that are given here, the one that is of interest to us is Kātyāyana – the one that is tagged to the last name Kabandhī.

It may be noted that in his commentary Bhagavatpāda gives a long explanation to this word Kātyāyana. He essentially points to the fact that this person Kabandhī belongs to the lineage of a seer/sage called ‘Kata’, and that his great-grandfather is alive (विद्यमानः प्रपितामहः). Rather what is implied is such an epithet – with युवप्रत्यय – is given only under special conditions being satisfied. In any case, this citation clearly points out that the term Kātyāyana is an epithet and not a proper name, at least as employed in this context!

Example 2 In the *Mahābhāṣya* of Patañjali, in the context of discussing the import of the *sūtra* लट् स्मे (3.2.118) we find the following verse (*kārikā*):

स्मादिविधिः पुरान्तो यद्यविशेषेण किं कृतं भवति ।
न स्मपुराद्यतन इति ब्रुवता कात्यायनेनेह ॥

What is of interest to us here is the use of the word Kātyāyana. Immediately following the above verse, we have the following commentary (in prose):

स्मादिविधिः पुरान्तो यद्यविशेषेण भवति, किं वार्तिककारः प्रतिषेधेन करोति – न स्मपुराद्यतन इति ॥

The above *kārikā* and the commentary when read together undoubtedly proves that the one who wrote the *vārtika* (वार्तिककार), is obviously Kātyāyana. This however, does not give us any cue regarding whether the word Kātyāyana, is a proper noun or an epithet to an individual who has some other name. The following verse which is traditionally used by scholars to pay their homage to the ancestors who have contributed in a major way to build this *vyākaraṇa-śāstra* gives us a hint that the word Kātyāyana could simply be an epithet.

वाक्यकारं वररुचिं भाष्यकारं पतञ्जलिम् । पाणिनिं सूत्रकारं च प्रणतोऽस्मि मुनित्रयम् ॥

This is so because, the word वाक्यकार that we find in the above verse, is identified by scholars with the वार्तिककार mentioned in the above lines cited from the *Mahābhāṣya* of

¹²It is clarified in Bhagavatpāda’s commentary that the word Vaidarbhi is not to be taken as a proper name, but as referring to ‘the one who belongs to a place Vidarbha’.

Patañjali. If this identification is correct, then one could reasonably argue and conclude that the actual name of the वार्तिककार is Vararuci, and that he is also referred to or described by the epithet Kātyāyana, which indicates the lineage to which he belongs, as shown in the previous example from the *Praśnopaniṣad*.

Example 3: In the *Bṛhadāraṇyakopaniṣad*, which is the most voluminous text among the ten ‘Principal’ *Upaniṣads*, the 5th Brāhmaṇa of the 4th chapter commences with an interesting episode. We quote below a short clip of the relevant *mantra* and the commentary corresponding to that portion authored by Śaṅkara Bhagavatpāda:

अथ ह याज्ञवल्क्यस्य द्वे भार्ये बभूवतुर्मैत्रेयी च कात्यायनी च तयोर्ह मैत्रेयी ब्रह्मवादिनी ...

याज्ञवल्क्यस्य ऋषेः किल द्वे भार्ये पत्न्यौ बभूवतुः आस्ताम् – मैत्रेयी च नामत एका, अपरा कात्यायनी नामतः।

Basically the narrative begins here with the statement that the sage Yājñavalkya had two wives, one by name Maitreyī and the other by name Kātyāyanī, and so on. Here again, what is of relevance to us, and noteworthy is the use of the words Maitreyī and Kātyāyanī. While offering his explanation to these words, Bhagavatpāda in his commentary seems to be explicitly declaring them as proper nouns or names of the two wives of Yājñavalkya. This is through the use of the phrase ‘*nāmataḥ*’ while describing the words Maitreyī and Kātyāyanī.

It may be good to recall here that the same Bhagavatpāda, in his commentary in the *Praśnopaniṣad*, presented an elaborate description to the word Kātyāyana, explaining how this epithet is to be understood and connected with the lineage. Here again it was possible for him to explain the formation of the word Kātyāyanī and indicate how it could be associated with the lineage, which would perfectly be a valid description as per the grammar rules. The only difference between the two words is the gender suffix tagged at the end. However, he hasn’t done that. Instead he has chosen to succinctly describe it by the phrase *nāmataḥ*. If only he wanted to show the connection with the lineage, even in this instance he would have succinctly described the word Kātyāyanī using the phrase *gotrataḥ*, and not *nāmataḥ*.

Example 4: Every student of the *Vyākaraṇa-śāstra*, who has who has passed through the traditional school of learning would be aware of the following invocatory sentence that is generally chanted before they begin their daily classes – that pays homage to the great masters of the discipline:

ओम् नमः पाणिनिकात्यायनपतञ्जलिभ्यः शब्दविद्यासंप्रदायकर्तृभ्यः वंशऋषिभ्यो नमो महद्भ्यो
नमो गुरुभ्यः।

The third string appearing in the above sentence is a compound word comprising three names — Pāṇini, Kātyāyana and Patañjali. In the context of other two names being proper nouns (संज्ञावाचकशब्द), one could also supposedly argue that the word Kātyāyana could also be a proper noun rather than it being an epithet referring to a descendant of the sage Kata.

Thus to summarise, based on the references given in examples 1 & 2 we find two Kātyāyanas, whose actual names are Kabandhī and Vararuci respectively. With the strength of the explanation given by Bhagavatpāda, cited in Example 3, and the practice of referring to the authors, as given in 4, one cannot completely rule out the possibility of the words Kātyāyana and Kātyāyanī being proper nouns too, rather than being mere epithets signifying the lineage.

In any case, with reference to the text *Kātyāyana-śulbasūtra*, since we have no other clue or evidence of the author's name being different from Kātyāyana, the *only* correct way to write his name would be Kātyāyana.

2.4.4 Manu

Regarding the query on मनु vs. मानव, I must say that I myself thought about it even before sending the earlier note to you, though I did not provide you with any details. The simple reason as to why I did not provide the details was that I did not have any textual evidence to support my view point. Fortunately, I was lucky to have found one now, by way of locating one paper manuscript. But before providing that evidence, I would also like to share with you the reasons with which I sort of convinced myself. To understand that we need to know what the word मानव can mean, and how it gets formed.

Formation of the word मानव from मनु

According to the rules of grammar, the word मानव is obtained from मनु by adding a *taddhita* suffix, as indicated earlier. There are primarily two possible derivations — by following the set of rules delineated below — providing two different meanings.

Derivation 1

मनु + अण् [तस्यापत्यम् ४.१.१२ इति अण्-प्रत्ययः]

- मानु + अ [तद्धितेष्वचामादेः ७.२.११७ इति आदिवृद्धिः]
- मान् + ओ + अ [ओर्गुणः ६.४.१४६ इत्यनेन उकारस्य गुणः ओकारः]
- मान् + अच् + अ [एचोऽयवायावः ६.१.७८ इति ओकारस्य अच्-आदेशः]
- मानव

In the first of the above lines, the suffix अण् has been added in the sense of progeny (अपत्यम्) of मनु । The descendant can be either direct or successive ones later in the lineage. That is,

‘अपत्यम्’ इत्यनेन शब्देन पुत्रपौत्रादीनाम् सर्वेषाम् ग्रहणम् भवितुमर्हति। अतः मानव इत्यनेन, मनोः साक्षादपत्यम्, मनोर्गोत्रापत्यं वा पुमान् गृह्येत।¹³

Since मनु is the first among the humans to be created after the huge deluge (प्रलय), this word मानव is generally taken to be referring to the entire human-race. That is any मनुष्य।

Derivation 2

मनु + अण् [तेन प्रोक्तम् ४.३.१०१ इति अण्-प्रत्ययः] (rest of the steps are the same)

As may be noted above, here the suffix अण् has been added in the sense of being stated (प्रोक्तं) by मनु । Thus मानव essentially means the words uttered by मनु ।

More specifically to refer to the writing / composition of a person, we find the following prescription in the *sūtra* of Pāṇini:

मनु + अण् [कृते ग्रन्थे ४.३.११६ इति अण्-प्रत्ययः] (rest of the steps are the same)

Thus, in this case, मानव essentially means the composition of मनु ।

Reasons as to why मनु is more likely to be the name of the author

Here I present three reasons – in the order of increasing strength – as to why the probability of the name of the author being मनु is much higher than that of मानव।

Reason 1: Since the word मानव could mean मनुष्य human-race in general (as per Derivation 1), it is quite unlikely that the proper name of the person is chosen that way.

Reason 2: Since we do not find (as far as my search goes) any evidence to the contrary to show that मनु is NOT the author (absence of बाधकयुक्ति), and the word मानव (as per Derivation 2) can actually refer to the composition of मनु – well within the framework of the grammatical rules laid down by Pāṇini – (presence of साधकयुक्ति), it is highly likely that मनु could be the name of the author.

¹³In fact, this very word is derived as – ‘न पतन्ति नरके पितरः येन, तद् अपत्यम्’ इति ।

3 Basis for the justification for the periods of the authors of *Śulbasūtra* texts?

It is quite hard, rather impossible to find any textual evidence to conclusively assign any dates to the *Śulbasūtra* texts. Even with respect to many other texts dealing with many other disciplines, all estimates that have been provided so far are primarily based on

- some clues that are available here and there in some other work, about some king referred to in that text, or an event happening, whose period is reasonably well established within a certain range, and then
- arbitrarily assigning some time gap (50, 100, 200, 300, etc years) between two authors, or the author and the commentator in succession, and
- at times based on the style of composition or the words employed in the text.

Particularly in the case of *Śulbasūtras*, the guess work actually commences with the mention of a king by name Puṣya-mitra by Patañjali in his *Mahābhāṣya*. From there, scholars try to assign some date to Pāṇini, and then to Kātyāyana who is the author of the *Vārtika*. If one were to identify this Kātyāyana with the author of the *Kātyāyana-Śulbasūtra*, then one can assign some date to our author. Whether such an identification is possible, and is reasonable is a BIG question! Anyway, based on some sort of an analysis, the text *Baudhāyana-śulbasūtra* is considered by most scholars to have been composed around 800 BCE. Lot of debate has been (and even now is) happening among scholars in attempting to date these texts by drawing upper and lower bounds. Though it is an interesting exercise in itself, I may caution that these are all purely based on flimsy evidence!

That said, in the following section – just for the sake of completeness – we present the *vighraha-vākyas* for the names of the four texts that have been discussed so far in detail.

4 Derivation of the names of the four *Śulbasūtra* texts

- बौधायनशुल्बसूत्रम् – बौधायनञ्च तत् शुल्बसूत्रञ्च (कर्मधारयसमासः)
- आपस्तम्बशुल्बसूत्रम् – आपस्तम्बकृतं शुल्बसूत्रम् (मध्यमपदलोपिसमासः)
- कात्यायनशुल्बसूत्रम् – कात्यायनकृतं शुल्बसूत्रम् (मध्यमपदलोपिसमासः)
- मानवशुल्बसूत्रम् – मानवञ्च तत् शुल्बसूत्रञ्च (कर्मधारयसमासः)