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SCIENCE AND RELIGION IN CLASSICAL INDIA*

David S. Landes, author of *The Wealth and Poverty of Nations: Why some are so rich and some so poor* (1998), is interested in what he considers one of history's great questions, namely: Why was Europe different? Part of the answer to this question can be found, he states [1], in a book by David F. Noble, called *The Religion of Technology: The divinity of man and the spirit of invention* (1999). In this book Noble draws attention to the religious roots and spirit of Western technology. He traces the Western idea of technological development from the ninth century, when the useful arts became connected to the concept of redemption, up to our own time, as humans begin to exercise Godlike knowledge and powers with nuclear weapons, manned space exploration, Artificial Intelligence, and genetic engineering. The link with redemption, be it noted, is not known to have existed before the ninth century. Noble (p. 16) mentions in particular Martianus Capella's fifth-century work *The Marriage of Philology and Mercury* (in Latin: *de nuptiis Philologiae et Mercurii*). In this work, Mercury gives his new bride the gift of seven arts – Grammar, Dialectic, Rhetoric, Geometry, Arithmetic,

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1. In a review published in the *Los Angeles Times* and reproduced on the back cover of Noble's *The Religion of Technology*. The following brief characterization of parts of Noble's book is also taken from the back cover.

Astronomy, and Harmony – each represented in a performance by a maiden. Capella omits the two mechanical disciplines Medicine and Architecture, because of their "baseness" and "unworthiness". This is justified in the following words: "Since these ladies are concerned with mortal subjects and their skill lies in mundane matters, and they have nothing in common with the celestial deities, it will not be inappropriate to disdain and reject them" [2]. This changed with the Carolingian philosopher John Scotus Erigena, who commented upon this work, and rewrote Capella's allegory so as to include the hitherto disdained mechanical arts. In Erigena's version, the bride Philology first receives Mercury's gift of the liberal arts, then gives him in return the parallel gift of seven mechanical arts, including Medicine and Architecture. In this way the mechanical arts are introduced [3], and are represented as having equal significance as the liberal arts. A new attitude towards these arts manifests itself here for the first time. Henceforth it accompanies them and their successors until the present day. This new attitude, according to Noble, has a clearly religious dimension.

It cannot be our task to pronounce on the correctness or otherwise of Noble's thesis. It should of course not be forgotten that many centuries were still to elapse between the Carolingian Erigena and the European Renaissance, centuries during which European technical and scientific prowess did not reach the height of certain other civilisations, most notably that of China. It will nevertheless be interesting to ask whether, and to what extent, religious attitudes may have played a role in the development of science in India. This is the question which the present paper will try to address.

We have seen that, according to Martianus Capella, the two disciplines Medicine and Architecture "are concerned with mortal subjects and their skill lies in mundane matters". This in its turn allowed him "to disdain and reject them", and contrast them with Grammar, Dialectic, Rhetoric, Geometry, Arithmetic, Astronomy, and Harmony,

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2. Stahl & Johnson, 1977: 346.

3. Erigena appears to be the first whose use of the expression artes mechanicae has survived, but he may not have been the first to use it; cf. Sternagel, 1966: 30 f. See further Whitney, 1990.

which are obviously not concerned with mortal subjects and which do not deal with mundane matters. The Indian enumerations of sciences are of course very different from the Western medieval enumeration of arts, but a superficial comparison of some items is certainly possible. India, like Europe, had a tradition of Medicine, which by its very nature dealt with mortal subjects and mundane matters. Are there reasons to think that in India, too, Medicine was looked down upon by comparison with sciences that deal with "higher" matters? [4]

There are. Already in Vedic literature it is clear that the profession of a physician is progressively becoming less respectable. The Taittirīya Saṃhitā (6.4.9.1 f.) has the following to say about the two Aśvins, divine physicians: "The gods said of the two: Impure are they, wandering among men as physicians. Therefore a brahmin should not practice medicine, for the physician is impure, unfit [to participate] in sacrifice" [5]. And the Āpastamba Dharmasūtra (1.19.14) contains the following verse, which it ascribes to a Purāṇa: "It is forbidden to eat the food of physicians, hunters, surgeons, fowlers, unchaste wives, or eunuchs" [6]. The Vasiṣṭha Dharmasūtra (14.2), similarly, states: "The following are unfit to be eaten: food given by a physician, a hunter, a harlot, a law enforcement agent, a thief, a heinous sinner, a eunuch, or an outcaste" [7]. And again (14.19): "Almsfood given by physicians, hunters, surgeons, fowlers, eunuchs, and unchaste wives is not to be accepted even if it is given unasked" [8]. The Mānava Dharmaśāstra (3.152) counts physicians among those to be excluded from certain privileges: "Doctors, priests who attend on idols, people who sell meat, and people who suport themselves by trade are to be excluded from offerings to the gods and ancestors" [9]. Elsewhere this same text

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4. For inscriptional evidence for the existence of Brahmins who practised the medical profession, see Gupta, 1983: 32 f.

5. Scharfe, 2002: 252 f.

6. Olivelle, 2000: 56-57: *cikitsakasya mṛgayoḥ śalyakṛntasya pāśinaḥ / kulaṭāyāḥ ṣaṇḍhakasya ca teṣām annam anādyam //*

7. Olivelle, 2000: 404-05: *cikitsakamṛgayupuṃścalīdaṇḍikastenābhiśasta-ṣaṇḍhapatitānām annam abhojyam.*

8. Olivelle, 2000: 406-07: *cikitsakasya mṛgayoḥ śalyahartus tu pāśinaḥ / śaṇḍhasya kulaṭāyāś ca udyatāpi na gṛhyat[e] //*

9. Manusmṛti 3.152: *cikitsakā devalakā māṃsavikrayoṇas tathā / vipaṇena ca jīvanto varjyāḥ syur havyakavyayoḥ //*; tr. Doniger & Smith, 1991: 59

(10.46-47) counts medicine *(cikitsita)* among the occupations despised by twice-born *(dvijānām nindita karman)*, this one to be practised by the Ambaṣṭhas. The Mahābhārata (12.37) enumerates the physician along with those who live by dancing or singing, clowns, a drunk, a crazy man, a thief, one who cannot speak, one whose skin is discolored, one who is missing a limb, a dwarf, a villain, and others; a virtuous man should not give gifts to them [10]. Elsewhere (3.124.9) the following observation about the Nāsatyas is put in Indra's mouth: "I hold that these two Nāsatyas are unworthy of the Soma. Since they are healers to the sons of the Gods, their calling excludes them" [11].

A number of Purāṇic passages suggest that not only the medical profession, but also mathematics/astrology/astronomy [12] was frowned upon in classical India. In a list of sinners drawn up by Marc Tiefenauer – in a recent study about the Purāṇic hells (2001: 106-108) – we find a number of unexpected terms, among them *gaṇaka*, *nakṣatrapāṭhaka*, *nakṣatrasūcaka*, *nakṣatrin*, and *cikitsaka*. The first four of these terms refer to astrologers and/or mathematicians; the last one to medical doctors.

Tiefenauer's list of 54 different terms contains some further surprises (why, for example, is it a sin to be a potter?), but the two noted above deserve further reflection. Neither medicin nor astral studies are in any way in opposition to the Sanskrit tradition. Medicin *(āyurveda)* can boast of some important early treatises in Sanskrit, and counts as an Upaveda. Astral studies *(jyotiḥ)* is nothing less than a Vedāṅga, a "limb of the Veda" [13]! Thakur (1981: 197) suggests that the opposition against the latter "was natural because astrological practices were contradicting the very basis of brāhmaṇical philosophy. While the

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10. Mhbh 12.37.29-31: *na dadyād… / na nṛttagītaśīleṣu hāsakeṣu ca dhārmikaḥ // na matte naiva conmatte na stene na cikitsake / na vāgghīne vivarṇe vā nāṅgahīne na vāmane // na durjane dauṣkule vā vratair vā yo na saṃskṛtaḥ /*; tr. Fitzgerald, 2004: 252.

11. Mhbh 3.124.9: *ubhāv etau na somārhau nāsatyāv iti me matiḥ / bhiṣajau devaputrāṇāṃ karmaṇā naivam arhataḥ //*. Tr. van Buitenen. Cp. Brinkhaus, 1978: 90.

12. These three are quasi-inseparable, as Albiruni confirms; cf. Sachau, 1888:152: "The science of astronomy is the most famous among them, since the affairs of their religion are in various ways connected with them. If a man wants to gain the title of an astronomer, he must not only know scientific or mathematical astronomy, but also astrology".

13. Inscriptional evidence confirms that Brahmanical astrologers sometimes received strong support from the royal court; see Gupta, 1983: 24 ff.

brāhmaṇical philosophy emphasised the theory of *karma* the astrologers bred an altogether different view of life, i.e., *bhāgyavāda* or fatalism". This proposed explanation must however be looked upon with scepsis. Brahmanical religion allowed various sometimes mutually contradictory points of view with regard to one's future destiny to coexist, and some of the most conservative Brahmins, the Mīmāṃsakas, had no place for the theory of karma right up to the middle of the first millennium C.E. and beyond.

However, the critical attitude towards astrology was not confined to the Purāṇas. The Mānava Dharmaśāstra forbids this activity to those Brahmins who, having abandoned all their possessions, spend the fourth quarter of their life wandering (*pra-* or *pari-vraj*) [14]:

> He must never try to obtain almsfood by interpreting portents or omens, by his knowledge of astrology or palmistry, by giving counsel, or by engaging in debates.

Elsewhere this same text (Manu 3.162-166) stipulates that an astrologer by profession *(nakṣatrair yaś ca jīvati)* counts among those who should be diligently avoided *(varjanīyāḥ prayatnataḥ)*. The inevitable question is: why should Brahmanical texts be critical with regard to people who practise a Vedāṅga? To find out, we have to consider the attitude of Buddhism with regard to the sciences.

Buddhist texts mention five sciences *(vidyāsthāna* or *sthāna)*. An enumeration occurs under verse 11.60 of the Mahāyānasūtrālaṃkāra (Sūtrāl(B) p. 70 l. 10-11): *pañcavidhaṃ vidyāsthānam/ adhyātmavidyā hetuvidyā śabdavidyā cikitsāvidyā śilpakarmasthānavidyā ca/* "Science is fivefold: the science of the self, the science of logic, the science of words, the science of medicine, and the science of arts and crafts (?)". We learn from the same text that a Bodhisattva "investigates the science of logic and the science of words to defeat others who are not so inclined, the science of medicine and the science of arts and crafts to help others who need it, and the science of the self to obtain perfect

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14. Manu 6.50: *na cotpātanimittābhyāṃ na nakṣatrāṅgavidyayā / nānuśāsanavādābhyāṃ bhikṣāṃ lipseta karhi* cit //. Tr. Olivelle.

knowledge for himself" [15]. These five sciences are referred to in a number of works in connection with the education of a prince [16].

The precise range of each of the five sciences is not in all cases equally simple to determine. The sciences of logic, words and medicine do not appear to be particularly problematic. The science of the self looks at first somewhat surprising in that most Buddhists reject the very existence of a self; perhaps it would be more correct to translate "science concerning oneself". It seems plausible that it covers much of what we would call Buddhist philosophy, which concerns the inner constitution of the person, and competes with Brahmanical philosophies that do centre on the nature of the self. The term "science of arts and crafts", finally, is totally obscure, and it is not impossible that this category would in practice be used, if at all, to find a place for areas of knowledge not covered by the other four sciences.

It is yet puzzling that astrology, astronomy and mathematics are absent from this list. It is all the more so when we recall that we have no knowledge of any Buddhist contributions to this science. This is in marked contrast with the contributions made by Buddhists to other areas of knowledge. Buddhists played an important role in the development of logic, of medicine, and of grammar. Buddhist philosophy has been particularly rich, and constituted for a long time a major challenge to Brahmanical thinkers. The areas just mentioned, be it noted, correspond to four of the five "sciences" enumerated above. Whatever developments there have been in the area of astrology, astronomy and mathematics – which do not figure among the five sciences – are due to the efforts of Brahmanical and Jaina thinkers [17]; for reasons that remain to be elucidated, the Buddhists did not participate [18].

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15. Sūtrāl(B) p. 70 l. 12-14:… *hetuvidyāṃ śabdavidyāṃ ca paryeṣate nigrahārtham anyeṣāṃ tadanadhimuktānām/ cikitsāvidyāṃ śilpakarmasthānavidyāṃ cānyeṣām anugrahārthaṃ tadarthikānām/ adhyātmavidyāṃ svayam ājñārtham/*

16. BHSD s.v. *vidyā-sthāna, sthāna*.

17. Note however Bapat, 1928: 97 ("He [a Jain monk, like a Buddhist monk] does not engage himself in any worldly trades, nor does he earn his livelihood by prescribing medicines or by interpreting signs, prognostications or dreams or by telling prophecies") with references to Āyār I.2.5.4,13.2.14; Utt II.33, VIII.13, XV.7, XX.45; Sūy I.12,9-10 I.14.19; SN 360, 927, 929; DN I.23-25.

18. Note however Pingree, 2001: 655 ("In or shortly before 1055 Daśabala, an astronomer from Gujarāt (he belonged to the Vālabhyānvaya) who enjoyed the

The one apparent exception to this observation turns out, at closer inspection, to confirm it. The long presentation of astronomical and astrological knowledge in the Śārdūlakarṇāvadāna (practically the whole of which was translated into Chinese already in the third century of the common era; see Mukhopadhyaya, 1954: xii f.; 1967: 71 f.; Burrow, 1956) [19] is put in the mouth of Triśaṅku, the king of the Mātaṅgas, and is part of his attempt to show the Brahmin Puṣkarasārin that he is well acquainted with Brahminical knowledge, and his son therefore worthy of the latter's daughter. Puṣkarasārin enumerates a long list of items which, in his opinion, justify the Brahmins' elevated position in society [20]. Beside a number of terms that refer to Vedic or related knowledge, there are several that are connected with astronomy and astrology: the zodiac *(mṛgacakra)*, constellations *(nakṣatragaṇa)*, lunar days *(tithikramagaṇa)*, eclipses (?; *rāhucarita*), the course of the planet Venus (?; *śukracarita*), the courses of the planets

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Buddhist title Mahākāruṇika Bodhisattva, composed sets of tables for computing tithis, nakṣatras, and yogas entitled Cintāmaṇi") with a reference to D. Pingree, *The Astronomical Works of Daśabala*, Aligarh: Viveka Publications 1988 (Aligarh Oriental Series 9), inaccessible to me. Yano (1987), moreover, discusses a Chinese text on Indian astrology, whose "author is the Buddhist monk Amoghavajra (A.D. 705-774) whose native place was somewhere in north India" (p. 125); Yano comments, however, that "Amoghavajra's knowledge of Indian astrology [...] is far from professional" (p. 133). The Mūlasarvāstivāda-vinaya does allow monks to calculate dates; see Salomon, 2001: 249-250, with a reference to Schopen, 1998: 173. Scharfe (2002: 158) comments on the absence of mathematics and astronomy/astrology in the list of sciences taught at Nālandā.

19. Another name appears to be Mātaṅgīsūtra. Nakamura (1980: 318) states: "This sūtra (i.e., the Mātaṅgī-sūtra, J.B.), translated into Chinese in the third century, was most likely compiled in Samarkand, judging from its astronomical informations". Regarding the origin or justification of this opinion, Nakamura gives no further information than that contained in his note 54: "Zenba in Tōa Sekai-shi (...), published by Kōbundō (...), vol. 2, p. 264". Yano (2005: 45) makes the following observation about this text: "The Śārdūlakarṇāvadāna, a part of Divya-avadāna, is one of the few Sanskrit texts in which the earlier stage of Indian astrology is systematically described. The date of this text is not known, but the knowledge of astrology in this text shows that the original part was formed sometime in the first to the second century A.D".

20. Mukhopadhyaya, 1954: 31; Divy(V) p. 328 l. 9-13. The complete list enumerates the following items: Ṛgveda, Yajurveda, Sāmaveda, Atharvaveda, Āyurveda, Kalpa, Adhyātma, Mṛgacakra, Nakṣatragaṇa, Tithikramagaṇa, Karmacakra, Aṅgavidyā, Vastravidyā, Śivāvidyā, Śakunividyā, Rāhucarita, Śukracarita, Grahacarita, Lokāyata, Bhāṣyapravacana, Pakṣādhyāya, and Nyāya.

(grahacarita). Triśaṅku is able to show Puṣkarasārin that he masters Brahminical knowledge as well as his interlocutor. This demonstration contains lots of information about the Veda (including the quoted Sāvitrī, RV 3.62.10) and other things of importance to Brahmins, including precisely a long section about astronomy and related matters [21]. This does not therefore indicate that the Buddhists were interested in this, but rather that they looked upon astronomy and astrology as being typically cultivated by Brahmins. We will come back to this point below.

Why did the Buddhists not participate in the development of what came to be known as *jyotiḥśāstra*, which combines astronomy, astrology and mathematics? To find an answer to this question it will be useful to recall what *jyotiḥśāstra* consists of: "Traditionally *jyotiḥśāstra* is divided into three *skandhas*: *saṃhitā* (omens), *gaṇita* (astronomy), and *horā* (astrology) [...] The validity of [this] tradition was maintained only by artificially including new forms of scientific writing – e.g., treatises on mathematics, on *muhūrta*, or on *praśna* – in one or another of the three *skandhas* [...]" (Pingree, 1981: 1). Unlike Geometry, Arithmetic and Astronomy in the early European tradition, *jyotiḥśāstra* was not originally, or in essence, far removed from mundane matters. Quite on the contrary, it may have been inseparably connected with mundane matters, in that those who practised it may often have had to make their living through explaining omens and predicting the future with the help of astrology. Such practices were however frowned upon in the Buddhist tradition from an early date onward. The following passage occurs in a number of early Buddhist sermons, and was believed to give expression to the Buddha's attitude with regard to them (tr. Walshe, 1987: 71-72) [22]:

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21. Mukhopadhyaya (1954: x f.) recalls that Triśaṅku in Brahmanical literature (Rāmāyaṇa, Mahābhārata, Harivaṃśa, Viṣṇupurāṇa, Bhāgavatapurāṇa) is the name of a king who was first degraded to the rank of the Caṇḍāla and subsequently became a constellation suspended in the air; the fact that Triśaṅku himself forms one of the constellations might explain that he says so much about the nature, characteristics, movements and activities of the constellations.

22. DN I.9-11 (Brahmajāla Sutta) = DN I.67-69 (Sāmaññaphala Sutta) = DN I.100 (Ambaṭṭha Sutta, pe) = DN I.124 (Soṇadaṇḍa Sutta, pe) = DN I.147 (Kūṭadanta Sutta, pe) = DN I.157 (Mahāli Sutta, pe) = DN I.159 (Jāliya Sutta, pe) = DN I.170 (Kassapa Sīhanāda Sutta, pe).

Whereas some ascetics and Brahmins, feeding on the food of the faithful, make their living by such base arts, such wrong means of livelihood as palmistry, divining by signs, portents, dreams, body-marks, mouse-gnawings, fire-oblations, oblations from a ladle, of husks, rice-powder, rice-grains, ghee or oil, from the mouth or of blood, reading the finger-tips, house- and garden-lore, skill in charms, ghost-lore, earth-house lore, snake-lore, poison-lore, rat-lore, bird-lore, crow-lore, foretelling a person's life-span, charms gainst arrows, knowledge of animals' cries, the ascetic Gotama refrains from such base arts and wrong means of livelihood.

Whereas some ascetics and Brahmins make their living by such base arts as judging the marks of gems, sticks, clothes, swords, spears, arrows, weapons, women, men, boys, girls, male and female slaves, elephants, horses, buffaloes, bulls, cows, goats, rams, cocks, quail, iguanas, bamboo-rats, tortoises, deer, the ascetic Gotama refrains from such base arts.

[.....]

Whereas some ascetics and Brahmins make their living by such base arts as predicting an eclipse of the moon, the sun, a star; that the sun and moon will go on their proper course - will go astray; that a star will go on its proper course - will go astray; that there will be a shower of meteors, a blaze in the sky, an earthquake, thunder; a rising, setting, darkening, brightening of the moon, the sun, the stars; and 'such will be the outcome of these things', the ascetic Gotama refrains from such base arts and wrong means of livelihood.

Whereas some ascetics and Brahmins make their living by such base arts as predicting good or bad rainfall; a good or bad harvest; security, danger; disease, health; or accounting, computing, calculating, poetic composition, philosophising, the ascetic Gotama refrains from such base arts and wrong means of livelihood.

[.....]

Whereas some ascetics and Brahmins, feeding on the food of the faithful, make their living by such base arts, such wrong mean of livelihood as appeasing the devas and redeeming vows to them, making earth-house spells, causing virility or impotence, preparing and consecrating building-sites, giving ritual rinsings and bathings, making sacrifices, giving emetics, purges, expectorants and phlegmagogues, giving ear-, eye-, nose-medicine, ointments and counter-ointments, eye-surgery, surgery, pediatry, using balms to counter the side-effects of previous remedies, the ascetic Gotama refrains from such base arts and wrong means of livelihood.

Passages like this one were obviously a strong disincentive for future monks and nuns to occupy themselves with such activities, which include the activities that came to be associated with *jyotiḥśāstra*. And indeed, these practices – collectively referred to as "pseudo-sciences" *(tiracchānavijjā)* – are again rejected in the collection of monastic rules (Vin II p. 139). It is open to question whether canonical passages like these ones were sufficient ground for Buddhists to abstain from participating in the development of mathematics, astronomy and astrology, but it seems that indeed they did abstain from doing so.

Let us now return to Brahmanism. We know that Buddhists and Brahmins did not like each other. The surviving literature of both religions is full of criticism addressed at the other. The history of Indian philosophy, for example, is in part the history of an ongoing battle between these two religions.

The profound distrust which Buddhists and Brahmins had for each other should not make us forget that the two lived for many centuries in the same areas, and could not but exert an enormous influence upon each other. This is not the moment to discuss or even illustrate this. I may however recall that several scholars, among them most recently Gregory Schopen, have drawn attention to the effect which the Brahmanical obsession with ritual purity had on the Buddhists, so much so that it finds expression in the Vinaya rules of the Mūlasarvāstivādins [23]. I myself have been able to point out in a recent publication that this influence may be responsible for certain theoretical developments in Buddhism, such as the elaboration of the notion of *dharmakāya* [24]. Here it is important to recall that this influence went both ways. Buddhist influence on Brahmanism can be shown to have taken place in various domains. In view of this, it is tempting to infer that the Buddhist rejection of astrology and related activities infected orthodox Brahmanism. Indeed, activities that were not good enough for Buddhists could not possibly be good enough for Brahmins.

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23. Schopen, 1992: 215 ff.
24. Bronkhorst, 2005.

We know that Buddhist influence did not stop the development of astrology, astronomy and mathematics in Brahmanism. Indeed, scholars have in recent years drawn attention to a number of remarkable accomplishments of Brahmanical mathematics in particular. It is yet intriguing to recall that Buddhists did not participate in these developments, at least in part for reasons of tradition. What is more, certain normative Brahmanical texts, probably under Buddhist influence, expressed themselves in negative terms about these sciences. We can only be grateful that not all Brahmins were ready to obey these prohibitions.

Abbreviations:

BHSD Franklin Edgerton, Buddhist Hybrid Sanskrit Grammar and Dictionary, vol. 2: Dictionary, New Haven 1953

BST Buddhist Sanskrit Texts, Darbhanga

Divy(V) Divyāvadāna, ed. P.L. Vaidya, Darbhanga 1959 (BST 20)

HIL A History of Indian Literature, ed. J. Gonda, Wiesbaden 1973 ff.

Manu Mānava Dharmaśāstra, ed. Olivelle.

RV Ṛgveda-saṃhitā

Sūtrāl(B) Asaṅga, Mahāyānasūtrālaṅkāra, ed. S. Bagchi, Darbhanga 1970 (BST 13)

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