

Independence and Certainty:

Prajñākaragupta's Argument on the Rising and the Setting of the Sun*

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1. Introduction

A central point of Dharmakīrti's *Buddhist* logic consists in the specification of the conditions for a good inferential reason property, such that it allows the derivation of a target property with certainty, i.e., without any deviation. According to Dharmakīrti, the property of being produced (*kṛtakatvam*) is a good inferential reason property insofar as it can prove the target property of being impermanent (*anityatvam*). This is because anything that possesses this property, i.e., anything which is produced by causes and arises under a certain set of conditions (*kṛtakam*), is independent (*nirapekṣam*) of anything other than itself for its cessation. Were it dependent (*sāpekṣam*) on anything else for its cessation, we could not conclude with certainty that it would cease to exist, since the possibility that the destructive function of these other things is somehow obstructed could not be excluded.¹⁾ In short, according to Dharmakīrti, if a thing's obtainment of a certain state is independent of other things, then the thing will necessarily attain that state; for this reason we can also be certain that the thing will obtain that state.

Non-Buddhist thinkers criticized this Dharmakīrtian equation of independence and necessity by resorting to various counterexamples in which something occurs necessarily but happens in dependence on other things. Among these counterexamples, the philosophically most interesting one is the rising and the setting of the sun. According to Dharmakīrti's opponents, the sun necessarily sets after it rises, and it certainly rises after it sets. In this way, the rising and the setting each happen to the sun necessarily but are dependent on something else, namely, on time (*kālah*). To the best of my knowledge, this counterexample is first seen in the *Vyomavatī*. It is taken up in the *Nyāyakandalī*, and in the *Nyāyabhūṣaṇa* we find a parallel counterexample involving the moon.²⁾ On the Buddhist side, Prajñākaragupta extensively deals with this counterexample. In this paper, I aim to

examine the so-called “sunrise problem” in its medieval Indian version, as discussed by Prajñākaragupta and his opponent.

2. Pūrvapakṣa

First, I introduce the non-Buddhist argument found in the Vyomavatī and the Nyāyakandalī.

Vyom 399,23–30 (= VyomMs 90b2–4): Moreover, what [has been said by the Buddhist opponents] in the following way: “Were cessation dependent on causes, cessation would not occur necessarily, like a color [that does not occur necessarily] in a cloth. This is because there is an incompatibility between being dependent and occurring necessarily.”³⁾ is not right, [first] because, since there is a deviation in one case, it is not observed to be so in every case; and [second] because, although being dependent in this way, a rising and a setting is observed [respectively] for the sun, planets, constellations, and stars; and [third] because (*iti*), if independent, there would be the setting immediately upon the rising, since no delay [in the exercising of a function] is possible for a [thing] capable [of exercising that function]⁴⁾; and [fourth] because (*iti*) the setting necessarily happens to the sun which has risen.⁵⁾

NKand 202,1–2: Moreover, what has been said [by the Buddhist opponents]: “Since non-existence [i.e., cessation,] is certain, [it] is not dependent on other causes.” is itself inconclusive due to the rising and the setting of the sun. This is because, if these two were independent, there would be no difference in time.⁶⁾

Although the latter description is simple and short, the point of both excerpts is the same and can be summarized as follows: Cessation necessarily occurs for produced things, i.e., produced things are certainly impermanent. This is accepted by both the Buddhists and their opponents. The Buddhists, however, understand that this certainty about cessation is due to the fact that produced things are independent as to their cessation. As mentioned, if they were dependent on causes, one could not accept that they necessarily cease. In that case, if the Buddhists, with regard to the rising and the setting of the sun, which are each accepted to occur necessarily, ascribed the necessity of these events to their independence—just like in the case of cessation—then they would have to assume that the setting happens immediately upon the rising, and the rising immediately upon the setting. This would imply that there is no difference in time, e.g., no difference between, morning, noon, and night etc. This is because, in Dharmakīrti’s ontology, for a thing *x* to be independent in becoming *y* means that there is no interval between the two states, and hence that *x* is

independent for y means nothing but that x immediately becomes y .⁷⁾

For the opponents, however, the rising and the setting of the sun occur necessarily, but they are dependent on time (*kālah*)⁸⁾: Only when the right time comes does the sun rise; only when the right time comes does it set. In the same way, although produced things are necessarily impermanent, they cease only when causes of cessation like hammers etc. are present. The implication is that produced things cease necessarily, but nevertheless endure until causes of cessation are present. That is, they are indeed impermanent, but never momentary.

3. Prajñākaragupta's Response

In the *Pramāṇavārttikālaṅkāra*⁹⁾ we find the same argument as that made by Vyomaśiva and Śrīdhara, examined above. How does Prajñākaragupta respond?

PVA 644,20–21 = Ed. Sakai 2022, 290,1–2: [Opponent's objection:] Is it not the case that, although being dependent, the setting and the rising of the sun occur necessarily? [According to you, necessary occurrence is due to independence.] If [in that case the rising and the setting of the sun] were independent, [then] immediately upon rising or setting, [the sun] would set or rise.¹⁰⁾
PVA 644,22–29 = Ed. Sakai 2022, 290,5–291,1: [Prajñākaragupta's response:] To this, [the following] is said:

The setting or the rising of the sun are not pervaded, respectively, by the rising or the setting [of the sun]. Sometimes it could be the case that it is otherwise. There is no valid cognition with regard to the opposite [i.e., the negative pervasion]. (PVA 4.601)

(1) Even if [we] do observe [it] repeatedly, it is nevertheless not [the case] that [the sun's] setting is pervaded by [its] rising, nor the case that [its] rising is pervaded by [its] setting, because there is no valid cognition [for either pervasion]. For it is so: The episode of the faithful and devoted [wife] has often been heard.

Moreover, there is the possibility [that it will not be as observed until now]. This is because in winter it is after a long time that [the sun] rises [and] it is at once that [the sun] sets. Like this, there is the possibility of being otherwise. (PVA 4.602)

(2) Moreover, the setting does not [belong] to the sun; but rather, [the setting] is the state of being cut off by mountains etc. And this state of being cut off [by mountains etc.] has to do with us and the like; but others, [like] yoga practitioners, never fail to see [the sun.] (3) What's more (*api ca*), as is stated [by Dharmakīrti in PV 1.194ab = PVin 2.53cd] "It is not observed that [any things] which are dependent occur necessarily,"¹¹⁾ there is the doubt that, even if it is the case that certain things occur necessarily, other things [than those], however, do not [occur necessarily].¹²⁾

Prajñākaragupta's direct answer to the opponent's objection is PVA 4.601, along with his own prose explanation consisting of the three parts (1)–(3).

In the first part (1), Prajñākaragupta does not accept that the setting is pervaded by the rising of the sun, i.e., that the sun which has set will rise necessarily; in the second part (2) he denies that the rising is pervaded by the setting, i.e., that the sun which has risen will set necessarily. According to him, even if these two positive concomitances were established on the basis of "repeated observation" (*bhūyodarśanam*), still there would be no valid cognition with regard to the opposite, i.e., no valid cognition which excludes the possibilities that the sun which has set does not rise and that the sun which has risen does not set.

To disprove pervasion of the sun's setting by its rising, Prajñākaragupta offers two arguments: The first is the episode of the faithful and devoted wife (*pativratopākhyānam*). This probably refers to the episode of Anasūyā (literally: a woman without envy, jealousy) recorded in the Mārkaṇḍeyapurāṇa (chapter 16, verses 27 to 32cd).¹³⁾ This woman prevents the sun from rising in order to save her husband, Kauśika, from the curse by Māṇḍavya: "He will get to die just after seeing the sun!" This episode functions as a counterexample to the positive concomitance that the sun which has set rises necessarily. It seems that, at the time of Prajñākaragupta, this episode—I cannot ascertain that the episode Prajñākaragupta had in his mind is exactly that in the Mārkaṇḍeyapurāṇa—was so widely known that it could function as a counterexample. The second argument is the sun's rising and setting in winter. In winter the sun rises later and sets quickly. The former case anticipates the possibility that the sun does not rise at all, no matter how long one waits, and the latter suggests the possibility that the sun sets immediately after rising. Both possibilities thus negate the pervasion of the sun's setting by its rising. If we think about winter days in deep valleys in the Himalayas where it gets dark quickly—or, even the polar night in winter in the northernmost region of Earth—the second argument of Prajñākaragupta makes good sense.

As for the negation of pervasion of the sun's rising by its setting, Prajñākaragupta, in the second part (2), argues that the phenomenon of the sun's setting does not exist as such. He says that what we normal people understand as the setting of the sun is actually the sun's moving behind mountains etc. That is to say, the sun itself continues to move and to exist there. Moreover, Prajñākaragupta insists that yoga practitioners do not fail to see the sun as

such. Obviously, the yoga practitioners are invoked here as those who can see objects beyond the senses (*atīndriyārthaḥ*). Based on these arguments, Prajñākaragupta concludes that the sun does not set in reality.

Interestingly, what Prajñākaragupta says in the third part (3) of his response is a kind of concession to the opponent's position. On the words "*api ca*," which introduce this part, Yamāri comments as follows:

Y D244a1-2, P311b7-312a1: The phrase "*api ca*" (*gzhan yang*; what's more) is [used in order] to convey that, even if these two [i.e., the sun's setting and rising] do not deviate from those two [i.e., the rising and the setting, respectively], it is not the case that there is no deviation in all cases. The rising and the setting are necessary for a certain [thing] (**kasyacit*; '*ga*' *zhig*) [i.e., for the sun]. Even if this is the case, nevertheless, this is not the case for any other two produced [things]. Hence, in this way, it is not the case that there is certainty [in all cases]. [If the opponent asks] "For what reason?" [Then, Prajñākaragupta] says: "[any things], which are dependent."¹⁴⁾

According to this commentary on part (3), it seems that Prajñākaragupta there accepts that rising and setting have the status of being dependent but certain, yet this is only the case for a certain thing, i.e., the sun. In other words, Prajñākaragupta does not allow the extension of this status to all cases. Yamāri's phrase "any other two produced things" (*gzhan byas pa dag*) seems to primarily imply the property of being produced (*kṛtakatvam*) and the property of being impermanent (*anityatvam*) or cessation (*vināśaḥ*) that is dependent on alleged causes of cessation like hammers etc. by the opponents.

4. Conclusion

Philosophically speaking, what Prajñākaragupta discusses in the excerpt examined above is, in terms of the sun's rising and setting, the problem of induction that David Hume raised and which was much debated by philosophers following in his footsteps, including Bertrand Russell.¹⁵⁾ The Buddhist logicians, at least after Dharmakīrti and, of course including Prajñākaragupta himself, are of the opinion that "repeated observation" (*bhūyo-darśanam*) is not sufficient for establishing pervasion. The opponent's counterexample, the rising and the setting of the sun, seems to have posed a significant challenge to the defense of this Dharmakīrtian position. As Kumāriḷa Bhaṭṭa says in his *Bṛhaṭṭīkā*, the claim that the sun will necessarily rise tomorrow¹⁶⁾ seems to be common knowledge at that time. In other words, with regard to this counterexample, no deviation has ever occurred in reality. In this

sense, Prajñākaragupta can be said to have made a significant effort in refuting this counterexample, i.e., in proving that there is no pervasion of the sun's setting by its rising (and vice versa). And obviously, there is a religious or apologetic demand behind his effort: For Dharmakīrti's successors, an acceptance of "being dependent but necessary" would have amounted to an acceptance that produced things are impermanent but not momentary. Accordingly, Prajñākaragupta seems to have been unable to disregard the setting and the rising of the sun as the opponent's counterexample. Thus, it should be concluded that his effort results in a religious or apologetic demand being sublimated into a philosophically universal problem.

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Notes

- 1) Cf. Sakai 2018, 422–423 (with fns 5 and 6). 2) Cf. NBhū 529,1–2, also cf. Sakai 2018, 430.
- 3) The source of this Buddhist *pūrvapakṣa* should be PVin 3 65,10–66,1, for which my English translation is available in Sakai 2018, 423. 4) Here, Vyomaśīva provisionally accepts Dharmakīrti's view that a causally capable, independent/solo thing must exercise its causal function not gradually, but immediately, i.e., no delay in exercising its causal function is possible. Cf. PVin 2 80,1–3: *na hi tasyākṣaṇikasyārthakriyā sambhavati, kramayaugapadyavirodhāt. akramah, anapekṣasya kartuḥ svasattāmātreṇa kṣepāyogāt.* 5) *yac cedaṃ vināśasya kāraṇāpekṣitāyām avaśyambhāvo na syād vastre rāgasyeva, sāpekṣitvāśyambhāvitvayor virodhād iti, tad asat, ekatra vyabhicāreṇa sarvatra tathābhavyasyānupalabdheḥ, tathā sāpekṣitve 'pi savitṛgrahanakṣatratārāṇāṃ codayāstamayopalabdheḥ, nirapekṣatve codayānantaram evāstamayaḥ syāt, samarthasya kṣepāyogāt (samarthasya {pe}kṣepāyogād Ms; samarthasyopakṣepāyogād Vyom), iti, avaśyaṃ coditasya savitṛ astamayo bhavati.* 6) *yac ca dhruvabhāvitvād abhāvasya hetvantarānapekṣety uktam, tad api savitṛ udayāstamayābhyām anaikāntikam. tasya anapekṣatve hi kālabhedo na syāt.* Cf. Sakai 2018, 429.
- 7) In Dharmakīrti's ontology, a causal complex in the final phase (*antyā kāraṇasāmagrī*), which immediately brings about its effect, exemplifies how independence results in immediateness. Cf. PV 4.285: *ye 'parāpekṣya tadbhāvas tadbhavanīyatā hi te / asaṃbhavadvibandheva sāmagrī kāryakarmani //*
- 8) This understanding of mine is based on the following description in the Nyāyakandalīpañjikā by Rājaśekharasūri. Cf. NKandP 202,2–3: *etāvātā savitṛ udayāstamayau kālabhedarūpasāmagryapekṣaṇāt dhruvabhāvināv api hetvantarasāpekṣāv ity uktam.* The time (*kālah*) in this context should be the regulative cause (*nimittakāraṇam*). For time as the regulative cause for the Vaiśeṣika school, cf. Halbfass 1992, chapter 9. 9) The following excerpts are the commentary on PV 4.285 mentioned above in n.7. 10) *nanu sāpekṣo 'py ādityasyāstamaya udayaś cāśyambhāvī / nirapekṣatāyām udayāstamayānantaram eva bhaved astamayodayam /* 11) PV 1.194ab: *sāpekṣāṇāṃ hi bhāvānām nāśyambhāvitvateṣyate /;* PVin 2.53cd: *sāpekṣāṇāṃ hi dharmānām nāśyambhāvitvateṣyate //*
- 12) *atrocitate — nodayāstamayavyāptir ādityāstamayodaye / kadācid anyathāpi syāt pramā nāsti viparyaye //* 601 // *yadi nāma bhūyodarśanam, tathāpi pramāṇābhāvān na vyāptir udayāstamayābhyām*

astamayodayabhavayoḥ / tathā hi pativratopākhyānaṃ śrūyate / sambhavaś cāsti hemante cirād udayabhavataḥ / jhaṭṭy astaṅgater bhāvāt tadvad anyatvasambhavaḥ // 602 // na cāstamaya ādityasya / api tu śailādināntaritatvam / tac cāntaritatvam asmadādyapekṣayā / pare tu yoginaḥ paśyanty eva / api ca sāpekṣāṇāṃ nāvaśyambhāviteti (cf. PV 1.194ab ≈ PVin 2.53cd) *yadi nāma keṣāñcid avaśyambhāvāḥ, pareṣāṃ tu na tatheti saṃśayaḥ.* 13) This episode is summarized in Hara 2002, 213, 202–201. I present here my tentative translation of the relevant part. (The numbering of the verses in the published edition is corrected by me, because they are not properly numbered.) MärkP 139,7–17: *pathi sūle tathā protam acauraṃ cauraśaṅkayā / māṇḍavyam atiduhkhārtam andhakāre 'tha sa dvijaḥ // 27 // patniskandhe samārūḍhaś cālayāmāsa kauśikaḥ / pādāvamaraṣaṇāt krudhho māṇḍavyas tam uvāca ha // 28 // yenāham evam atyarthaṃ duḥkhitaś cālitaḥ padā / daśaṃ kaṣṭam anuprāptaḥ sa pāpātmā narādhamāḥ // 29 // sūryodaye 'vaśaḥ prāṇair vimokṣyati na saṃśayaḥ / bhāskarālokanād eva sa vināśam avāpsyati // 30 // tasya bhāryā tataḥ śrutvā taṃ śāpam atidāruṇam / provāca vyathitā sūryo naivodayam upaiśyati // 31 // tataḥ sūryodayābhāvād abhavat saṃtātā niśā /* “Then, on the way, in the darkness, that twice born [i.e., brahmin,]—Kauśika riding upon the shoulder of [his] wife—kicked Māṇḍavya away, who was pierced with a spit/spear in that way [and thus] suffered excessive pain. [This was done] because of fear [that he might be] a robber, [but in fact he was] not a robber, [but an ascetic]. Māṇḍavya, who, of course, got angry because of being touched with the foot, said to him: “He, by whom I have been kicked away with [his] foot [and thus] very much pained in this way, has got into a miserable state of life, is evil-minded, the vilest of men. When the sun rises, he will be deprived of [his] life helplessly, there is no doubt [about this]. He will die just after seeing the sun!” Then, after having heard that rather horrible curse, his perturbed wife proclaimed: “The sun will never come to the rise!” Then, there was no rising of the sun; therefore, there was a continual night.” 14) *'di dag de gnyis kyis 'khrul pa med pa yin yang / thams cad du mi 'khrul pa ni ma yin no zhes brjod pa ni / gzhan yang zhes bya ba'o // gal te 'char ba dang nub pa 'ga' zhiḡ gdon mi za bar yin pa de lta na yang gzhan byas pa dag ni de lta ma yin pas zhes bya ba gdon mi za bar 'gyur pa ma yin pas so // ci'i phyr zhe na / ltos pa dang bcas pa rnam ni zhes bya ba'o //* 15) One of the main points Humean philosophers have been discussing is that what we can expect from frequent repetitions of two things' coexistence, e.g., that of flame and heat, is an increased probability that it will be the same next time, but not the certainty that it will be so, since a failure can occur. Russell, indeed, invokes “the sunrise” when discussing the problem of induction. As a possible failure for the sunrise, he postulates: “if the earth came suddenly into contact with a large body which destroyed its rotation.” Cf. Russell 1912, 99,21–24. His philosophical question or interest when he says this is whether “the laws of motion will remain in operation until to-morrow.” That is, his position is that, inasmuch as the natural sciences are based on inductive reasoning as such, their results cannot reach certainty, and thus what we seek is probability. Cf. Russell 1912, 99,24–100,1. 16) In the *Pramāṇavārttikasavarttiṭkā*, Kaṇakagomin cites a series of verses which he reports to have been said by bhāṭṭa (*yad ucyate bhāṭṭena...*). Among them there is the following verse (PVSVT 18,2–3): *yaḥ savitrudayo bhāvī na tenādyodayo 'nvitaḥ / atha cādyodayāt so 'pi bhavitā śvo 'numīyate //* “That which is a future rising of the sun is not accompanied [spatio-temporally] by the rising today. But nevertheless, from the rising today it is inferred that it [i.e., the sun] itself will rise tomorrow.” Yoshimizu's English translation is available in Yoshimizu 2007, 1085. This kind of inference seems to have been generally acceptable.

Abbreviations

NBh *Śrīmad-ācārya-Bhāsarvajña-praṇītasya Nyāyasārasya svopajñāṃ vyākhyānaṃ Nyāyabhūṣaṇam.*

Ed. Svāmī Yogindrānanda. Vārāṇasī: Śaḍdarśanaprakāśanapraṭiṣṭhāna, 1968. **Vyom** *The Praśastapādabhāṣyam by Praśasta Devāchārya with Commentaries Sūktī by Jagadīśa Tarkālāṅkāra, Setu by Padmanābha Mīśra and Vyomavatī by Vyomaśivchārya*. Ed. Gopinath Kavirāj. Benares: Chowkhamba Sanskrit Series Office, 1930. **VyomMs** Sanskrit manuscript of the Vyomavatī. University of Mysore. Oriental Research Institute. Film no. N-2756, Ms no. C-1575. **PVin 3** *Dharmakīrti's Pramāṇaviniścaya, Chapter 3*. Ed. Pascale Hugon and Tomabeche Toru. Sanskrit Texts from the Tibetan Autonomous Region 8. Beijing: China Tibetology Publishing House; Vienna: Austrian Academy of Sciences Press, 2011. **NKand** *Nyāyakandalī: Being a Commentary on Praśastapādabhāṣya, with Three Sub-Commentaries*. Ed. J. S. Jetly and Vasant G. Parikh. Gaekwad's Oriental Series 174. Vadodara: Oriental Institute, 1991. **NKandP** In: **NKand**. **PV 4** In: "Pramāṇavārttika-kārikā (Sanskrit and Tibetan)." Ed. Miyasaka Yūsho. *Acta Indologica* 2, 1971/1972. **PVA** *Pramāṇavārtikabhāṣyam or Vārtikālāṅkāraḥ of Prajñākaragupta. (Being a Commentary on Dharmakīrti's Pramāṇavārttikam)*. Ed. Rāhula Sāṅkrītyāyana. Tibetan Sanskrit Works Series 1. Patna: Kashi Prasad Jayaswal Research Institute, 1953. **PV 1** *The Pramāṇavārttikam of Dharmakīrti, the First Chapter with the Autocommentary. Text and Critical Notes*. Ed. Raniero Gnoli. Serie Orientale Roma 23. Roma: Istituto Italiano per il Medio ed Estremo Oriente, 1960. **PVin 2** *Dharmakīrti's Pramāṇaviniścaya, Chapters 1 and 2 Critically Edited*. Ed. Ernst Steinkellner. Sanskrit Texts from the Tibetan Autonomous Region 2. Beijing: China Tibetology Publishing House; Vienna: Austrian Academy of Sciences Press, 2007. **Mārḱ** *The Critical Edition of the Mārkaṇḍeya-purāṇam*. Vol. 1 (Adhyāyas 1-75). Ed. M. L. Wadekar. Vadodara: Oriental Institute, 2011. **Y** *Pramāṇavārttikālāṅkāraṭīkā Supariśuddhā*. Tibetan translation. D4226 (Phe 174b1-Tse 251a7), P5723 (Phe 208a7-Tse 321a5). **PVSṬ** *Ācārya-dharmakīrteḥ pramāṇavārttikam (svārthānumānaparicchedaḥ) svopajñāvatīyā karṇakagomiviracitayā taṭṭīkayā ca sahitaṁ*. Ed. Rāhula Sāṅkrītyāyana. Allahabad: Kitāb Mahal, 1943. Reprint, Kyoto: Rinsen Book, 1982.

Bibliography

Sakai, Masamichi. 2008. "On Dharmakīrti's Notion of Contingency/Dependence, with a Special Focus on *vināśa*." *Journal of Indian Philosophy* 46(3): 419-436. **Halbfass, Wilhelm. 1992.** *On Being and What There Is: Classical Vaisesika and the History of Indian Ontology*. Albany: State University of New York Press. **Russell, Bertrand Arthur William. 1912.** *The Problems of Philosophy*. London: Williams and Norgate. **Yoshimizu, Kiyotaka. 2007.** "Reconsidering the Fragment of the Br̥haṭṭīkā on Inseparable Connection (*avinābhāva*)." In *Pramāṇakīrtiḥ: Papers Dedicated to Ernst Steinkellner on the Occasion of His 70th Birthday*, Part 2, ed. B. Kellner, H. Krasser, H. Lasic, M. T. Much, and H. Tauscher, 1079-1103. Wiener Studien zur Tibetologie und Buddhismuskunde 70. Wien: Arbeitskreis für Tibetische und Buddhistische Studien, Universität Wien. **Hara, Minoru 原 實. 2002.** "Kodai Indo no joseikan (1) " 古代インドの女性観 (1). *Kokusai Bukkyōgaku Daigakuin Daigaku kenkyū kiyō* 国際仏教学大学院大学研究紀要 5: 230-189. **Sakai, Masamichi 酒井真道. 2022.** "Purajunyakaraguputa ni yoru setsunametsu no shōmei: Pramāṇavārttikālāṅkāra ad PV IV 283-285 wayaku kenkyū" プラジュニャーカラグプタによる利那滅の証明: Pramāṇavārttikālāṅkāra ad PV IV 283-285 和訳研究. *Purajunyakaraguputa kenkyū* プラジュニャーカラグプタ研究 [*Prajñākaragupta Studies*] 2: 265-294.

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