

## Rising Star Paradigms: Encoding Seasonal Times in Arabic *Saj'a* Rhymes

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**Abstract.** An ancient art form which may have predated classical Arabic poetry, Arabic rhymed prose—a piece of which is called *saj'a*—contains a rhyme at the end of each phrase, but no internal meter, making it easy to memorize and transmit orally. This form of Arabic literature found many uses in pre-Islamic times for orations and in early Islamic times for both religious formulaic practices and secular aphorisms. Among these was a growing set of maxims that used rhymed prose to describe the seasonal conditions that occurred at the heliacal rising of a star or asterism. These pieces of rhymed prose addressed changes in the weather itself, as well as floral, faunal, and social behaviour that occurred during this time. This collection of astronomically-inspired rhymed prose grew over time to incorporate more star names and new rhymed phrases within many of the pieces. This paper draws from original Abbasid-era Arabic sources—including Qutrub (d. 821 CE), Ibn Qutayba (d. 889 CE) and his contemporary Abū Ḥanīfa (d. 896 CE), and al-Marzūqī (d. 1030 CE)—to provide insight into the content and structure of these pieces of rhymed prose, using the stars of the Scorpion (*al-'aqrab*) as a representative sample.

### Introduction

Arabic rhymed prose—a piece of which is called *saj'a*—is an ancient art form that may have predated classical Arabic poetry. It featured a rhyme at the end of each phrase, but no internal meter, making memorization and oral transmission easy. Arabs used *saj'a* for orations and secular aphorisms, as well as formulaic Islamic practices. One application facilitated seasonal forecasting by connecting the heliacal rising of a particular star to the weather and its associated floral, faunal or societal activity. The heliacal rising of a star is the annually recurring first observable rising of a star in the east amid the growing light of dawn. Seasonal timing depends on the latitude of the observer on the earth, precession of the equinoxes, locally observable horizon lines, atmospheric clarity during the observation, and the brightness of the star being observed.

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This research features for the first time original translations into English from Abbasid-era Arabic collections of rhymed prose that featured helical risings. These sources are *Kitāb al-azmina wa talbiyat al-jāhiliyya* by Qutrūb (d. 821 CE), *Kitāb al-anwā'* by Ibn Qutayba (d. 889 CE), portions of a work by Abū Ḥanīfa (d. 896 CE), as transmitted by Ibn Sīda (d. 1066 CE) in his *Kitāb al-mukhaṣṣaṣ*, and *Kitāb al-azmina wa l-amkina* by al-Marzūqī (d. 1030 CE).<sup>1</sup>

The oldest extant collection of *saj'a* for heliacal risings (that of Qutrūb) included rhymed prose for just twenty-three star groupings; most stars were bright enough to be observed rising in the east in the waxing light of dawn. Over time, the number of named star groupings for which a piece of *saj'a* existed grew to thirty-eight, including all twenty-eight lunar stations (*manāzil al-qamar*). Some of these added stars were too faint for direct observation during their heliacal risings.

The translations here are just a sampling of nearly eighty pieces of rhymed prose that referenced thirty-eight specific star groupings. Of them, seventy began with the formulaic opening phrase, 'When [*x* star name] rises...' (*idhā ṭala 'a [x]*). Because the star name appeared at the end of this phrase, each additional phrase rhymed with the star name. Many pieces of *saj'a* lengthened over time as new phrases were added. This likely occurred organically, as individual authorship was never attributed to these pieces, unlike much of classical Arabic poetry.

In the brief treatments that follow, each piece of rhymed prose is first presented in Arabic script as it would have appeared within a portion of prose text, which is read right-to-left. Following this, the Arabic transliteration and this author's original translation appear with one rhymed phrase per line to emphasize the rhyme at the end of each phrase. Although this emulates the typical presentation of poetry, Arabic rhymed prose was not regarded as poetry, because it lacked internal meter.

### The Scorpion

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<sup>1</sup> Abū 'Alī Muḥammad b. al-Mustanīr Qutrūb, *Kitāb al-azmina wa talbiyat al-jāhiliyya*, ed. Ḥatim Šamiḥ al-Dāmin (Beirut: Mu'assisat al-Risāla, 1985); Abū Muḥammad 'Abdallāh b. Muslim Ibn Qutayba al-Dīnawārī, *Kitāb al-anwā' (fī mawāsim al-'Arab)* (Hyderabad: Maṭba'at Majlis Dā'irat al-Ma'ārif al-'Uthmāniyya, 1956); Abū al-Ḥasan 'Alī b. Ismā'īl Ibn Sīda, *Kitāb al-mukhaṣṣaṣ*, 16 vols (Būlāk, Egypt: al-Maṭba'a al-Kubrā al-Amīriyya, 1898-1903); Abū 'Alī Aḥmad b. Muḥammad b. al-Ḥasan al-Marzūqī, *Kitāb al-azmina wa al-amkina*, 2 vols (Hyderabad: Maṭba'at Majlis Dā'irat al-Ma'ārif al-Kā'ina, 1914).

The Scorpion (*al-‘aqrab*) was a large constellation whose interpretation as a scorpion had persisted since Mesopotamian times, as early as 3200 BCE.<sup>2</sup> Although this long constellation was shortened in order to use its leading pincer stars as a separate zodiacal constellation, ultimately forming Libra, Arabs continued to recognize a complete Scorpion whose rising began with its Pincer (*az-zubānā*), followed by its Crown (*al-iklīl*), its Heart (*al-qalb*), and its Raised Tail (*ash-shawla*). The whole constellation took close to a month and a half to rise heliacally out of the eastern horizon ahead of the sunrise, from the start of November through mid-December, according to the timetable recorded by Ibn Qutayba.<sup>3</sup>

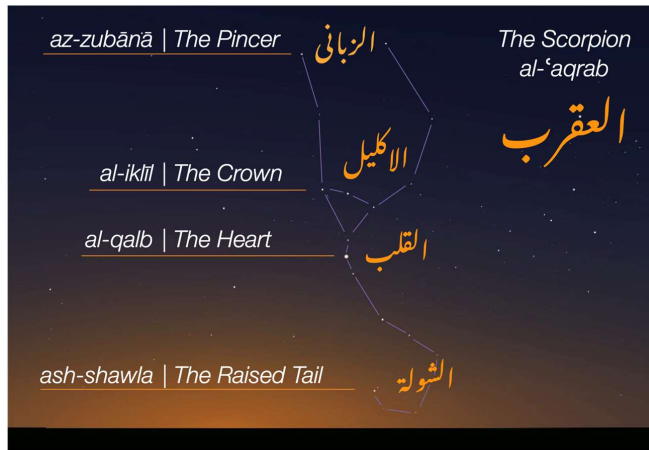


Fig. 1. The Scorpion (*al-‘aqrab*) constellation.

The rhymed prose that follows is from the record of Qutrub, with minimal variations recorded by Ibn Qutayba and his contemporary, Abū Ḥanīfa, and al-Marzūqī a century later.<sup>4</sup> The fifth rhymed phrase was recorded by Ibn Qutayba alone, likely as a later addition.

<sup>2</sup> John H. Rogers, ‘Origins of the ancient constellations: I. The Mesopotamian traditions’, *Journal of the British Astronomical Association* 108, no. 1 (1998): pp.24–25.

<sup>3</sup> Ibn Qutayba, *Kitāb al-anwā’*, pp.68–72.

<sup>4</sup> Qutrub, *Kitāb al-azmina*, p.27; Ibn Qutayba, *Kitāb al-anwā’*, p.72; Ibn Sīda, *Kitāb al-mukhaṣṣaṣ*, v.9, p.16; al-Marzūqī, *Kitāb al-azmina*, v.2, p.181.

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إِذَا طَلَعَتِ الْعُقْرُبُ، جَمَسَ الْمَدْنَبُ، وَمَاتَ الْجُنْدَبُ، وَقَرِبَ الْأَشْتَبُ، وَلَمْ يَصِرَّ الْأَخْطَبُ.

*idhā ṭala`ati l-`aqrab* When the Scorpion rises,  
*jamasa l-midhnab* the valley rivulet freezes,  
*wa māta l-jundab* the locust deceases,  
*wa qaruba l-ashyab* the hoarfrost approaches,  
*wa lam yaṣirra l-akḥṭab* and the rasping shrike ceases.

In the second rhymed phrase, the Arabic word *jamasa* meant ‘to congeal’, and it was applied to substances like grease or butter, while *jamada* (‘to become solid’) was more typically used with water. Since the Scorpion began to rise in early November, it may be that *jamasa* was used here to suggest the incomplete freezing of the water before it was fully cold. Coming from the same root meaning as *dhanab* (‘tail’), the word *midhnab* indicated a thin rivulet or stream that wound through a valley.

Desert locusts died in the third phrase due to low temperatures, which also would have prevented the laying and maturation of eggs. In the fourth rhymed phrase, the Arabic word *ashyab* literally meant ‘white-haired’, but Qutrūb commented that its use here intended the whiteness of the snow or frost.<sup>5</sup> Abū Ḥanīfa added an alternate verb for this phrase: *qarra l-ashyabu*, meaning ‘the frost becomes cold’. Al-Marzūqī also recorded for this phrase a different verb that he attributed to an-Naḍr bin Shumayl, a contemporary of Qutrūb: *farfara l-ashyabu*, meaning ‘the frost is stirred up’.<sup>6</sup>

Ibn Qutayba alone included the fifth phrase for this piece of rhymed prose, which suggests it had been added after the time of Qutrūb. The Arabic term *akḥṭab* described a dusky-coloured bird that may have had black markings, likely one of the various species of shrikes (*ṣurad* in Arabic) or a bee-eater (*shaqirraq*).<sup>7</sup> Shrikes were known for their rasping, grating calls, and indeed the rolled r’s in the verb *yaṣirra* reflected this through onomatopoeia. The absence of these calls meant that the shrikes had migrated south for the winter.

### The Pincer

<sup>5</sup> Qutrūb, *Kitāb al-azmina*, p.27.

<sup>6</sup> Al-Marzūqī, *Kitāb al-azmina*, v.2, p.181.

<sup>7</sup> Edward William Lane, *An Arabic-English Lexicon*, 8 vols (Beirut: Librairie du Liban, 1997), v.2, p.763.

The Pincer (*az-zubānā*) of the Scorpion consisted of two widely-separated stars that rose heliacally during the morning twilight of 1 November, as reported by Ibn Qutayba.<sup>8</sup> As per the identification given by aṣ-Ṣūfī, these stars are known today as Zubenelgenubi ( $\alpha$  Librae) and Zubeneschamali ( $\beta$  Librae).<sup>9</sup>

The rhymed prose that follows is from the record of Ibn Qutayba, with small variations recorded by Abū Ḥanīfa and al-Marzūqī.<sup>10</sup>

إِذَا طَلَعَتِ الرُّبَانَى، أُحَدِّثُ لِكُلِّ ذِي عِيَالٍ شَأْنَهُ، وَ لِكُلِّ ذِي مَاشِيَةٍ هَوَانَهُ، وَقَالُوا كَانَ وَكَانَا، فَاجْمَعِ  
لِأَهْلِكَ وَلَا تَوَانَا.

*idhā ṭala ‘atī z-zubānā* When the Pincer rises,  
*aḥdathat li-kulli dhī ‘iyālin shānā* it creates for each household head worries  
*wa li-kulli dhī māshiyatin hawānā* and for each she-camel breeder ignominies,  
*wa qālū kāna wa kānā* and they tell “Once upon a time...” stories;  
*fa-jma ‘li-ahlīka wa lā tawānā* so, gather for your kin, and do not be at ease.

In the second rhymed phrase, the Arabic word *‘iyāl* indicated a family in the sense of a household, the group of people with whom one lived (as opposed to one’s relations). The household head was responsible for the care and sustenance of this group of people, a task that was made more difficult as winter approached. The rising of the Pincer meant that it was time for household heads to get their affairs in order.

Similarly, the approach of winter created special needs for those who raised camels. The Arabic term *māshiya* referred to a female camel that had many offspring, and it was essential to the breeder that the young camels survive the winter. So important was this that the breeder was willing to suffer *hawān*, public disgrace or debasement. Ibn Qutayba explained, ‘The owner of the breeding she-camel abased himself in the pursuit of her welfare’.<sup>11</sup> In recording this rhymed phrase, both Abū Ḥanīfa, and al-Marzūqī omitted the word *dhī*, which changed the meaning to ‘and for each she-camel ignominies’ and lost the sense of public disgrace that the breeder was willing to endure.

<sup>8</sup> Ibn Qutayba, *Kitāb al-anwā*, p.68.

<sup>9</sup> Abū al-Ḥusayn ‘Abd al-Raḥmān b. ‘Umar al-Ṣūfī, *Kitāb ṣuwar al-kawākib al-thamāniya wa al-arba‘īn* (Beirut: Dār al-Āfāq al-Jadīda, 1981), p.202.

<sup>10</sup> Ibn Qutayba, *Kitāb al-anwā*, p.69; Ibn Sīda, *Kitāb al-mukhaṣṣaṣ*, v.9, p.16; al-Marzūqī, *Kitāb al-azmina*, v.2, p.183.

<sup>11</sup> Ibn Qutayba, *Kitāb al-anwā*, p.69.

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The Arabic phrase *kāna wa kāna*—literally, ‘There was and there was...’—was used to begin the telling of a story, in the same way that stories in English often began with ‘Once upon a time...’ This fourth rhymed phrase suggested that the lengthening nights afforded more opportunity for people to tell stories around the fire.

The final phrase in this piece of rhymed prose consisted of two imperatives. Using the word *ahl* this time, which indicated a ‘family’ in the sense of one’s relations, the first command was to gather provisions for family members. The second command was to not flag or lose vigour in doing so, which conveyed a sense of urgency as the winter approached. Here, al-Marzūqī used *tatawānā*, a slightly different form of the verb *tawānā*, which nonetheless conveyed the same meaning.

### The Crown

The Crown (*al-iklīl*) of the Scorpion consisted of three moderately bright stars in the formation of a small arc. They rose heliacally during the morning twilight of 14 November, as reported by Ibn Qutayba.<sup>12</sup> As per the identification given by aṣ-Ṣūfī, these stars are known today as Acrab (β Scorpii), Dschubba (δ Scorpii), and Fang (π Scorpii).<sup>13</sup>

The rhymed prose that follows is from the record of Ibn Qutayba, with small variations recorded by Abū Ḥanīfa and al-Marzūqī.<sup>14</sup>

إِذَا طَلَعَ الْإِكْلِيلُ، هَاجَتِ الْفُحُولُ، وَشُمِرَتِ الدُّيُولُ، وَتُخُوِّفَتِ السُّيُولُ.

*idhā ṭala‘a l-iklīl* When the Crown rises,  
*hājati l-fuḥūl* lusty are the male camels,  
*wa shummirati dh-dhuyūl* gathered up are the skirts,  
*wa tukhuwwifati s-suyūl* and feared are the torrents.

In the second rhymed phrase, the Arabic word *fahl* (here in its plural form, *fuḥūl*) indicated a stallion, which could be the male of any animal, but it often indicated a male camel rather than a male horse. The stallions were described as having been stirred up by lust (*hājat*), as the winter months were the time of rutting for camels, just as it remains today. In addition to the verb *hājat*, Abū Ḥanīfa noted the use of an alternate verb, *habbat*,

<sup>12</sup> Ibn Qutayba, *Kitāb al-anwā’*, p.69.

<sup>13</sup> Al-Ṣūfī, *Kitāb ṣuwar al-kawākib*, p.202–4.

<sup>14</sup> Ibn Qutayba, *Kitāb al-anwā’*, p.70; Ibn Sīda, *Kitāb al-mukhaṣṣaṣ*, v.9, p.16; al-Marzūqī, *Kitāb al-azmina*, v.2, p.183.

which in the context of this phrase did not alter the meaning. Al-Marzūqī recorded *hājat* as the similar-sounding *hājat*, which meant ‘to desire.’

The final two rhymed phrases worked together, as the fourth phrase explained the third one. People gathered up their skirts or long hemlines because of the heavy rains that caused the ground to become muddy. Indeed, these rains could also produce torrential flows of water (*ṣuyūl*) across the hard earth, threatening both people and property.

### The Heart

The Heart (*al-qalb*) of the Scorpion was represented by a brilliant red star that rose heliacally during the morning twilight of 27 November, as reported by Ibn Qutayba.<sup>15</sup> As per the identification given by aṣ-Ṣūfī, this star is known today as Antares ( $\alpha$  Scorpii).<sup>16</sup>

The rhymed prose that follows is from the record of Ibn Qutayba, which includes two verses recorded by Qutrub and small variations in the latter verses recorded by Abū Ḥanīfa and al-Marzūqī.<sup>17</sup>

إِذَا طَلَعَ الْقَلْبُ، جَاءَ الشِّتَاءُ كَالْكَلْبِ، وَصَنَارَ أَهْلُ الْبُؤَادِي فِي كَرْبِ، وَلَمْ تَمْ كَيْنَ الْفَحْلُ إِلَّا دَاتُ  
تُرْبِ.

<i>idhā ṭala ‘a l-qalb</i>	When the Heart rises,
<i>jā ‘a sh-shitā ‘u ka-l-kalb</i>	like the dog the winter comes,
<i>wa ṣāra ahlu l-bawādī fi karb</i>	distressed are the desert-dwellers,
<i>wa lam tumakkini l-fahla illā dhātu tharb</i>	And the male camel has none but emaciated females with lumps of fat on their bellies.

The earliest extant version of this piece of rhymed prose was recorded by Qutrub, and it ended with the second rhymed phrase. The comparison of the coming of winter to a dog had its explanation in another star name: the Two Grumbling Dogs (*al-harrārān*). The star that was called the Heart of the Scorpion ( $\alpha$  Scorpii) was also one of the Two Grumbling Dogs; the other member of the pair was  $\alpha$  Lyrae, a bright white star known today as Vega. Although widely spaced in the sky, this pair of stars rose together—or nearly so, depending on one’s latitude—at the end of November or early December, when the night was rather cold. The name in Arabic, *al-*

<sup>15</sup> Ibn Qutayba, *Kitāb al-anwā’*, p.70.

<sup>16</sup> Al-Ṣūfī, *Kitāb ṣuwar al-kawākib*, p.202.

<sup>17</sup> Qutrub, *Kitāb al-azmina*, p.28; Ibn Qutayba, *Kitāb al-anwā’*, pp.70–71; Ibn Sīda, *Kitāb al-mukhaṣṣaṣ*, v.9, p.16; al-Marzūqī, *Kitāb al-azmina*, v.2, p.183.

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*harrārān*, employed onomatopoeia, as the rolled r's in the word reflected the agitated growling of a dog that was uncomfortable on account of the cold weather.<sup>18</sup> Thus, as one of the Two Grumbling Dogs, the Heart of the Scorpion rose as winter came like a (grumbling) dog.

In the third rhymed phrase, the ending rhyme changed from *-alb* to *-arb*, which suggests that this and the fourth phrase were both later additions. Because of the adversity of the winter, people found themselves in a state of emotional distress (*karb*), the kind that took one's breath away or pressed upon one's heart. Ibn Qutayba and al-Marzūqī recorded the phrase 'the inhabitants of the desert' (*ahlu l-bawādī*), but the version transmitted by Abū Ḥanīfa used the phrase, 'the inhabitants of the valley' (*ahlu l-wādī*). Whether living in the desert or in the valley, these people may have felt distress because the cold weather made food difficult to find.

The rhymed prose for the Crown described the stallion camels as stirred up by lust; in the rhymed prose for the Heart, those stallions were said to have been limited to females camels that possessed *tharb*, the Arabic term for the integumentary fat that covered the belly of a camel. Ibn Qutayba commented that 'a camel that can produce clarified butter and fat because she yielded her milk (without being pregnant) in the cold because of her emaciation' also would have desired the stallion intensely.<sup>19</sup> The female camels had integumentary fat because of their pseudopregnancies, which resulted from their emaciation due to the scarcity of food during the winter.

### The Raised Tail

The Raised Tail (*ash-shawla*) of the Scorpion was a close pair of stars at the end of the tail of the Scorpion. They rose heliacally during the morning twilight of 10 December, as reported by Ibn Qutayba.<sup>20</sup> As per the identification given by aṣ-Ṣūfī, these stars are known today as Shaula (λ Scorpii) and Lesath (ν Scorpii).<sup>21</sup> Next to this pair of stars was the Sting of the Scorpion (*ibrat al-'aqrab*), a star cluster that could be seen as a spot of cloud with the unaided eye.

The rhymed prose that follows is from the record of Ibn Qutayba, with small variations recorded by Abū Ḥanīfa and al-Marzūqī.<sup>22</sup>

<sup>18</sup> Ibn Qutayba, *Kitāb al-anwā'*, p.71.

<sup>19</sup> Ibn Qutayba, *Kitāb al-anwā'*, p.71.

<sup>20</sup> Ibn Qutayba, *Kitāb al-anwā'*, p.72.

<sup>21</sup> Al-Ṣūfī, *Kitāb ṣuwar al-kawākib*, p.209.

<sup>22</sup> Ibn Qutayba, *Kitāb al-anwā'*, p.72; Ibn Sīda, *Kitāb al-mukhaṣṣaṣ*, v.9, p.16; al-Marzūqī, *Kitāb al-azmina*, v.2, p.183.



إِذَا طَلَعَتِ السُّوَيْلَةُ، أُعْجِلَتِ الشَّيْخُ الْبُوَيْلَةُ، وَاسْتَنْدَتْ عَلَى الْعَائِلِ الْعُوَيْلَةُ، وَفِيْلَ شَتْوَةُ زُوَيْلَةُ.

<i>idhā ṭala‘ati sh-shawla</i>	When the Raised Tail rises,
<i>a ‘jalati sh-shaykha l-bawla</i>	the elder the daughter hastens,
<i>wa-shtaddat ‘alā l-‘ā‘ili l-‘awla</i>	family need presses household heads,
<i>wa qīla shatwatun zawla</i>	and it is called a wondrous freeze.

In the second rhymed phrase, the elder (*shaykh*) was being urged by someone else to do something more quickly than he otherwise would have done. Although the Arabic word *bawl* (without the feminine ending) meant ‘urine’, the word *bawla* (with the feminine ending) indicated female offspring: a daughter. Because none of the authors provided additional commentary, it is unclear why the daughter hastened the elder and how this behaviour was connected to the winter. Al-Marzūqī omitted ‘the elder’ in this phrase, leaving it as ‘the daughter hastens’.

Returning to a theme from the rhymed prose for the Pincer, in the third rhymed phrase for the Raised Tail, the winter has made it difficult for household heads. Sharing the same root meaning, the Arabic term *‘ā’il* meant the one who nourished the household, and the word *‘awla* indicated the needs that the household had for sustenance. Thus, the need for nourishment pressed hard on the one who was responsible for providing nourishment to his household. Alternatively, *‘awla* also indicated the wailing or weeping that came from deep grief, and so the phrase could be interpreted, ‘wailing becomes hard upon household heads’. In contrast to Ibn Qutayba, both Abū Ḥanīfa and al-Marzūqī recorded *‘ā‘ili* here as *‘iyāl* (‘household’), which changed the meaning of the phrase to ‘family need presses upon households’.

In the final phrase of this piece of rhymed prose, *shatwatun zawla* was a common saying that meant ‘a wonderful winter’, one that created a sense of wonder or astonishment because of its harshness. Al-Marzūqī recorded this phrase as *wa qabala shaqwatan wa zawlatan*, which changed its meaning to ‘and they receive adversity and wonder’. Because al-Marzūqī had also used ‘household’ instead of ‘household head’ in the previous phrase, it was the whole household that received adversity and wonder (astonishment) because of the harsh winter.

### Discussion

Inspired by the annually recurring heliacal risings of prominent stars and building on pieces of *saj‘a*, an established genre of oral Arabic rhymed

Commented [KW1]: Does this need an i at the end?

Commented [KW2]: should it be: shatwatun?

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prose that was easy to transmit and remember, Arabs in the first millennium CE created memorable maxims that forecasted seasonal changes and their impacts upon flora, fauna, and society. The foregoing brief survey of just a single constellation and its four prominent elements has demonstrated the breadth of material that was covered by these pieces of Arabic rhymed prose.

The piece of rhymed prose for the Scorpion as a whole addressed directly the freezing of the valley rivulet and the arrival of hoarfrost, as well as the resulting regional departure of the locust and the rasping shrike. The piece of rhymed prose for the Pincer recalled social practices as people set their affairs in order, both for their human households and for their camels, gathering supplies and provisions with a sense of urgency. At the same time, the evenings grew longer, affording more time to tell stories around the fire. The piece of rhymed prose for the Crown highlighted the rutting behaviour of camels and the human impacts of heavy rains that produced localized flooding. The piece of rhymed prose for the Heart described the distress of dogs and humans, in addition to camels that were so emaciated that they entered pseudopregnancies. The piece of rhymed prose for the Raised Tail focused on human responses to the harshness of the winter, from hastening the elder to households being pressed with need or grief and feeling a sense of astonishment.

This author has previously introduced the concept of the celestial chronotope, the application of Bakhtin's literary chronotope to stars as cultural texts that could be read by anyone in the community who knew their meanings as they embodied the intersection of time and space in the sky.<sup>23</sup> By embedding star names within pieces of easily transmissible rhymed prose, Arabs directly connected the literal positions of stars in time and space—their heliacal risings just above the eastern horizon at a specific time of night, as the growing light of dawn overcame them—to the seasonal changes that they heralded, which also occurred in time and space. This therefore expanded the range of cultural material that would have been evoked by the mention of such a star or star grouping, making it more prominent as a cultural text. The inspiration of these astronomical phenomena to create enduring pieces of oral transmission that forecast the coming of seasons and their floral, faunal, and societal impacts is a clear

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<sup>23</sup> Danielle K. Adams. 'Rains Stars Set, Lunar Stations Rise: Multivalent Textures of Pre-Islamic Arabian Astronomy and the Hegemonic Discourse of Order' (PhD dissertation, University of Arizona, 2018), pp.44ff.

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example of the intersection of literary art with astronomical science and human culture.

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