Brief Report

Additional Findings from Art and Literature Related to the Presence of Alternative Lateral Gaits in Past Horse Breeds

Alan Vincelette *

Posted Date: 8 April 2025

doi: 10.20944/preprints202504.0654.v1

Keywords: horse gaits; pacing gait; alternative lateral gaits; domestic horses

 doi:10.20944/preprints202504.0654.v1

Brief Report

Additional Findings from Art and Literature Related to the Presence of Alternative Lateral Gaits in Past Horse Breeds

Alan Vincelette

St. John's Seminary, USA; avincelette@stjohnsem.edu

Abstract: Most domesticated horse breeds along with wild equid species (zebras and asses and Przewalski's Horse) make use of three standard gaits, the walk, trot, and gallop (or canter). Specialized horse breeds, however, such as the Tennessee Walker, Missouri Fox Trotter, American Saddlebred, Standardbred, Rocky Mountain Horse, Icelandic, Mangalarga Marchador, and Paso horses of South America are able to employ alternative lateral gaits including the running walk, rack, fox trot, broken pace, and hard pace. How these gaits arose and spread throughout the world is still something of a mystery, as is what exact benefits they provided to human riders. This brief survey provides further information that has come to light on the presence and use of such alternative lateral horse gaits in art and history subsequent to the author's previous publications.

Keywords: horse gaits; pacing gait; alternative lateral gaits; domestic horses

---

Celtic and Persian horses were prized by Greeks and Romans for their smooth gaits. Pliny the Elder, in his *Naturalis historia* 8.57 (77 AD), spoke highly of Celto-Iberian horses from Galacia and Asturia in Northern Spain (larger theldones and smaller asturcones) that had an atypical gait (non vulgaris), one which was supple (mollis) and involved the successive uncoiling of balled limbs (alterno crurum explicatu glomeratio). He contrasted such horses with other horse breeds which are taught to adopt a speedy trot (tolutim carpere incursus). Silius Italicus, in his *Punica* (84 AD), 3.339, clarified that the Asturians used the smaller horses (parvus sonipes) to hunt in the Pyrenees mountains or to launch javelins in battle from afar. And Vegetius, in his *Digesta artis mulomedicinae* 1.56 and 3.6 (ca. 430–435 AD), gushed about the Persian saddle horses which possessed splendid gaits of great value (incessus nobilitate pretiosos), namely, intermediate gaits (ambulatura media) falling between those of trotters (tolutarios) and canterers or gallopers (trepidarios; totonarios). These gaits (ambulaturae) were supple [molles] and energetic [impigros], involving short and quick steps (gradus … minutus, celer), and so delighted and excited the rider (qui sedentem delectet et erigat). Vegetius goes on to describe how Parthian horses (i.e., those from the Parthian region of northeastern Persia), while not taught (condiscant) by artificial means to walk at a trot (tolutim ambulare), are trained (edomant) to canter or gallop (trepidarios; tottonarios) in a manner resembling the gait found in the Spanish Asturian horses (asturconibus). On account of which, they gait supplely (mollire; molliter) and comfortably (commodius), in a light and flattering manner (levitatem et quaedam blandimenta vecturae; pulchrius), with short steps (minutos gressus; minutum ambulans), elevated legs (altius crura), and flexed knees and hocks (inflexione geniculorumn atque gambarum) [1].

Such descriptions may well describe horses with alternative lateral gaits, namely intermediate speed gaits, such as the running walk, rack, stepping pace, or pace, wherein ipsilateral limbs are coordinated and move forward together to a great degree, as opposed to a trot in which diagonal limbs do so. In fact, we know that the later gaited horse breeds found in North and South America derived from gaited Iberian horses imported into these regions during the sixteenth and seventeenth centuries [2,3]. However, such texts do not fully distinguish between alternative lateral gaits and more animated walks or trots. Hence it is useful to turn to artistic portrayals of horses to investigate

 doi:10.20944/preprints202504.0654.v1

ancient horse gaits. Unfortunately, it is often hard to be sure if an artist intended to portray a horse in an alternative lateral gait, such as a rack, rather than in a more standard animated walk (or prance according to one of its definitions not involving rearing), or even a horse merely lifting up one forelimb or stamping (suggested especially when the two hind legs are in parallel alignment).

Artistic depictions of horses wherein three legs are on the ground and only a front leg is flexed in the air are most likely attempts to portray a horse in an elegant prancing walk (or perhaps stamping its foot). Such a depiction is found in Hellenistic bronze statuettes [Metropolitan Museum of Art, New York, no. 23.69], as well as in the equestrian statues of Marcus Nonius Balbus the Younger and the Elder discovered in the ruins of the Herculaneum forum (ca. 50 AD) [Naples National Archaeological Museum, no. 6104 and 6211], the bas-relief of the Celtic goddess Epona from Dalheim, Luxembourg (ca. 200 AD) [Luxembourg National Museum of Art and History, no. 261], and the Cavalli di San Marco from Constantinople (ca. 200 AD), subsequently moved to St Mark's Basilica in Venice in the Middle Ages.

Interpretation is murkier when both a forefoot and its ipsilateral hind foot are off the ground at the same time in an artistic rendering of a locomoting horse. Sometimes, it is hard to determine if the author intended to depict both the rear hoof and its ipsilateral front hoof to be off the ground at once or only the front hoof. This is the case with coins portraying Alexander the Great (ca. 492-480 BC) and the Thracian king Sparadokus (ca. 440 BC), a picture of the retinue of Oldrich of Bozena in the illuminated Latin translation of the *Dalimilova kronika* (ca. 1335), and Donatello's equestrian statue of Gattamelata (1453) located in the Piazza del Santo of Padua, Italy.

If both the rear hoof and its ipsilateral front hoof are both clearly off the ground to some degree this is very suggestive of an alternative lateral gait. For while in an animated or collected walk sometimes the front hoof lifts off the ground just before its ipsilateral hind hoof makes contact, this usually occurs when the hooves come together near the anterio-posterior center of the horse's body. Hence depictions of horses in which the hind foot is raised off the ground (or angled and just coming down) and its ipsilateral front foot is flexed and raised off the ground out in front of the horse's body may well depict a horse in a slow racking gait, or running walk if the hind legs are angled far apart. Still it is hard to rule out the possibility that such portrayals betoken artistic license in rendering a horse in an animated collected walk or one transitioning to a walk from a standstill. In any case, artworks portraying horses in an ipsilateral gait wherein the front hoof is in the air (often on a flexed leg) and its ipsilateral hind hoof is angled with its tip just making contact with the ground commonly occur in Renaissance renderings of kings or other nobles. For example, they are found in the seal of Elizabeth of Sevorc (ca. 1275) [see Johns, 2006, p. 64; British Museum, no. 1987,0103.1], frescoes of Sir John Hawkwood and Niccolò da Tolentino (ca. 1436-1456) located in the Florence Cathedral, Florence, Italy, Andrea del Verrocchio's equestrian statue of Bartolomeo Colleoni (1483-1496) located in Campo Santi Giovanni e Paolo, Venice, Italy, Antoine Vérard's painting of Charlemagne and Pope Adrian I (1493), and Guido Mazzoni's equestrian statue of Louis XII at Blois Castle (1507). They even occur in early Assyrian art from the North Palace of Nineveh (645-635 BC) where gaits of the rack and running walk may well be represented [British Museum, London, no. 1856,0909.21 and 1856,0909.48, no. 124876] [4].

On the other hand, artwork depicting horses in a gait in which the hind hoof is clearly off the ground and horizontal to it, and its ipsilateral front leg is lifted high in the air in a flexed position (and often the contralateral hind leg contacts the ground but extends out past the rear of the horse) seem to clearly represent alternative lateral gaits, whether that of a rack, stepping pace, or pace. That is, here the artist seems to render intermediate ipsilateral gait parallels of the stylized diagonal trots seen in various equestrian statues, including such Roman and Byzantine statues as the Gilded Equestrian Bronzes from Cartoceto, Pergola, Italy (ca. 75 B.C.-50 A.D.), an equestrian statue of a Roman youth (ca. 50 AD) [British Museum, # 1864,1021.2], the reconstructed Mazzocchi horse statue from the Herculaneum Quadriga (ca. 75 AD) [Naples National Archaeological Museum, # 4904], the equestrian statue from the Arch of Caligula (ca. 75) [Naples National Archaeological Museum, # 5635], certain Hellenistic coins of the Macedonian ruler Philip I riding a horse, the equestrian statue

 doi:10.20944/preprints202504.0654.v1

of Marcus Aurelius (ca. 175) on the Capitoline Hill in Rome, the Regisole equestrian statue of Ravenna-Pavia (ca. 475), the column of Justinian in Constantinople (543), the medieval equestrian statue of "Charlemagne" from Metz, France (ca. 742-870) [Louvre Museum, Paris, # OA 8260] and the portrayal of Jesus entering Jerusalem in the *Queen Mary Psalter* (ca. 1310-1320) [British Library, Royal Manuscript 2.B.VII, fol. 233v], and Renaissance equestrian statues such as those of Niccolò III d'Este, in Ferrara, Italy (1451), Francisco Sforza, left unfinished by Leonardo da Vinci (1482), Cosimo l and Ferdinando I, in Florence, Italy (1594 and 1608), and Henri IV at the Pont Neuf in Paris, France (1614), Philip III in Madrid, Spain (1616), and Alessandro and Ranuccio Farnese, in Piacenza, Italy, 1620-1625.

As it turns out, such artistic portrayals of horses with both ipsilateral limbs clearly off the ground are not uncommon in antiquity. A marble relief of a Greek horseman (ca. 75-25 BC) shows a horse that may well be pacing with both ipsilateral feet off the ground [Metropolitan Museum of Art, Gallery 164, no. 07.286.111], echoes another Hellenistic relief with two horses in this sort of "pacing" gait, suggesting perhaps a common model [5–7], and is similar to a horse and rider from Block W-9 of the West Frieze of the Parthenon (ca. 440 BC) portraying a procession of the Panathenaic festival [8] involving a lead horse in a pace or being reined to a halt, perhaps the former more than the latter in light of similarities to other portrayals noted here. Though the neck of the horse from the Parthenon West Frieze has a neck held vertically and held pulled back this can occur in a racking gait. Another early statuette that could well depict a horse in an alternative lateral gait is a Romano-British figurine (now housed in the British Museum, 1990.0101.1-2) dating to 200-400 AD, and likely from the Brills Farm site in Norton Disney, Lincolnshire, England [9,10]. It depicts an armored soldier or god riding a horse. Stylistically, as noted above, it is similar to the equestrian statue portraying the emperor Marcus Aurelius riding on a horse on the Capitoline Hill of Rome. However, the Norton Disney horse figurine has two ipsilateral legs clearly off the ground as opposed to the two diagonal limbs found in the Marcus Aurelius equestrian statue. It also seems to be intentionally moving in an elegant presentation. The Norton Disney figurine has accordingly been interpreted as a horse displaying an amble on the haunches, i.e., a stepping pace with lowered hindquarters [9], or a hard pacing gait [11,12], rather than a trot. If, as it seems, the Norton Disney statue does depict a four-beat alternative lateral gait such as a rack (wherein ipsilateral front and hind legs are highly coordinated and move forward together), it would be the earliest known occurrence in Western art of a gaited horse. Moreover, it would suggest that gaited horses were in England quite early, probably being brought to England by the Celts, and not introduced later by the Vikings (in fact the reverse may be true). With only one such early statue known from Roman Britain, however, it is hard to be sure of its relevance, and the possibly remains that it might represent some sort of artistic license in rendering a walk or portray an alternative lateral gait found in a non-British horse. It is not until the Pictish Strathclyde kingdom (ca. 800-900 AD) that we see striking depictions of racking horses on Scottish stone slabs from such sites as Meigle, Pershire, and Cross Slab in Edderton, Easter Ross. These seem to be examples of gaited Hobby and Galloway horse breeds, or their close kin. On the Continent, in turn, gaited Palfrey horses seem to have been popular with the nobility in the Middle Ages. One horse in the Bayeux Tapestry depiction of the battle of Hastings, England (ca. 1077) displays a clear racking gait, with both ipsilateral legs raised high off the ground: this is the horse traveling from left to right in panel 50 [13]. The reverse sides of the royal seals of King Richard I (1195-1197), John (1215), and Henry III (ca. 1246) of England, Normandy, and Aquitaine also appear to show horses ridden in a rack [British Museum, # 2000.0103.6 and 1987.0103.1; seal of the Magna Carta from Salisbury Cathedral], as does the later city seal of Pavia, Italy (ca. 1450).

Renaissance pictures of nobility riding gaited Palfrey horses in a rack became commonplace in illuminated manuscripts. We find clear racking gaits depicted in Apocalypse manuscripts of ca. 1275 and 1325 [*The Apocalypse*, British Library, Add MS 35166; *Queen Mary Apocalypse*, British Library, Royal MS 19.B.XV, fol. 37r], the Scottish *Queen Mary Psalter* [British Library, Royal Manuscript 2.B.VII, fol. 151r] and *Queen Mary Prayer Book* (ca. 1310–1320) [Huntington Library, San Marino, California, Manuscript 1200, fol. 80v], the Scottish *Taymouth Hours* (ca. 1325–1335) [British Library, Yates

 doi:10.20944/preprints202504.0654.v1

Thompson Manuscript 13, fol. 163r and 164r], the French *Très riches heures du Duc de Berry* (ca. 1410-1416) [Musée Condé, Chantilly, France, fol. 5v and 8v], and paintings of Alexander the Great on Bucephalus and of other nobles on horses in *Le livre et la vraye hystoire du bon roy Alixandre* (Paris, c. 1420-1425) [British Library, Royal Manuscript 20, B.XX, fol. 12r, 47v, 62v, and 78r], as well as in the Devonshire Hunting Tapestries of ca. 1425-1450 [Victoria and Albert Museum, London, T 202-1957]. In addition, the series of illuminated manuscripts titled *Libro de la merescalria de li cavalli* (ca. 1375-1434) attributed to Boniface of Calabria (ca. 1270), but most likely authored by Antonio Dapera, displays several horses in a racking gait, including some with evidently wealthy riders [British Library, MS 15097, fol. 2v; Morgan Library, MS M.735, fol. 3v; Biblioteca Estense di Modena MS it.464, fol. 24v] [14–17]. Finally, Jean Bourdichon's depictions of Louis XII traveling to the town of Genoa to quell a revolt, in Jean Maro's illuminated manuscript *Le voyage de gênes* (ca. 1510), figures him on a racking horse.

These artworks are matched by medieval descriptions of nobility, including lords, abbots, and knights, traveling on ambling horses. Epistle 116 attributed to Fulbert of Chartres (ca. 1020) notes the presence of ambling horses [equum ambulatorium] in France, and the Register of Bishop John de Sandale of Winchester (1319) records his stables housing three Palfrey horses for the lord [18]. Ekkehard IV, in his *Casus Sancti Galli* (ca. 1040), ch. 97 and 127, relates how the monks of St. Gall travelled on ambling horses [ambulator; ambulatrix] which were quite fast [velocissimam], suitable [decibilem], and lively [alacrem]. Alexander Neckham, in fact, in his *De natura rerum* (ca. 1190), ch. 158, traces (probably fancifully) the etymology of the palefridus horse to its proceeding on a rein in a gentle step [passu leni fraenum ducens]. The *Vita sancti Guillermi abbatis de Datia* (ca. 1224), n. 45, goes into detail about how a Danish abbot was able to get his horse [equus] to switch from its natural or normal gait [naturalem cursum; soliti cursus] to a "flat step" [gressus planos] or "ambling" gait [ambulando]. By the time of Giovanni Boccacio (see his *Decameron* (1353), 8.3, knowledge of gaited horses was so common that a simile is drawn comparing the risk of pursuing one thing and thereby missing out on another to "losing out on the trot for the amble" [perduto il trotto per l'ambiadura].

When it comes to knights, Bernard of Clairvaux, in Epistle 45, n. 12 (ca. 1120) observes a soldier dressed in fine clothes riding around town on an ambling horse [ambulatorem]. And Szczerbicz Paweł, in his *Speculum Saxonum*, 3.51 (ca. 1610), contrasts the dexterous [dextrariis] ambling [ambulatoribus] with the running [cursoribus] horses of soldiers. The spurious *Caroli Magni Decretum de expeditione romana* (ca. 1190) mandates that lords should be given two horses by their vassals for a journey, one for running [currens; praecurrendum] and the other for ambling [ambulans; spatiandum] [19]. European knights seemingly often rode ambling palfrey horses [palfridus] to the site of a battle, for comfort and prestige and not to wear out their galloping destrier or courser war horse, then switched to a galloping horse for warfare [20,21]. This is just how the matter is described in a Welch version of a medieval French romance, the *Campeu Charlymaen*, n. 99, wherein knights transfer from palfreys to galloping horses before battle [22,23].

Alternatively gaited horses were also known in the East. The establishment of the Silk Road ca. 200 BC during the Han Dynasty between Egypt, Greece, India, Asia, and Europe, allowed interchange of livestock, including horses, and helped to spread Scythian gaited horses to areas such as India (which perhaps gained gaited horses even earlier through immigration of Indo-Iranians, or later through Greco-Bactrian rule) and Southeast Asia.

In any case, there are many scenes of chariot transporting nobles with horses moving in fast pacing gaits in the Han period of China (ca. 150-175 AD), such as Eastern Han frescoes and reliefs found in coffin chambers from Anping and Zhuxi Counties of the Hebei Province, and in tomb 23 at Dabaodang from Shenmu County in Shaanxi Province [24–26]. In addition, a frieze from the tomb of Wang Deyuan in the Shaanxi Province of China (ca. 101 AD) shows a horse being trained in gait very similar in appearance to that of the "flying pace" seen in the famous flying horse of Gansu statue [[27], Figure 110]. A similar Han Dynasty statue depicting a horse in a "flying pace" or fast two-beat hard pace can be found in the Philadelphia Museum of Art [no. 2005-92-1]. And in the later Tang Dynasty (636 AD), one of the six steeds belonging to Emperor Taizong, and sculpted for the Zhao

 doi:10.20944/preprints202504.0654.v1

Mausoleum – the Tequin or Telebiao steed, whose name derives from the Turkish title 'tegin' – shows a horse in a hard pace [Beilin Museum, Xi'an, Shaanxi Province, China], as does the tomb of crown prince Li Xian [Zhanghuai] (706 AD) which had frescoes depicting a hunt with riders on hard pacing horses. And finally a hard pace is seen in a painting of a goose hunt from the Yuan Dyasty (ca. 1300) [National Palace Museum, Taipei, no. guhua 000872]. Ability for alternative lateral gaits, in fact, may have been quite widespread in the East, as a scroll of the Edo period (18th century [?]) from the Konshai region of Honshu Island, Japan, likely depicts riders on horses in various gaits at an equestrian school including the gallop, hard pace, and rack, and perhaps the broken pace, and running walk [28]. Such gaits still survive today in such Eastern breeds as the Chakouyi living on the Tibetan Plateau and the Hokkaido [Dosanko] of Japan [29].

Knowledge of such alternative lateral horse gaits advanced immensely with the development of videography in the early nineteenth-century. Besides Edward Muybridge, who videotaped horses in a "rack" (singlefoot) and an "amble" (including a saddle rack, hard rack, stepping pace, pace, and a "single-foot gait") [30], another early videographer of horse gaits, Stillman, videotaped the road gait ("single-foot") of the North American Singlefooting Horse, along with its stepping pace (amble) [[31]; see also [32]]. Here we see how sometimes the term "singlefoot" is used to name the saddle rack or the four-beat alternative lateral gait, wherein at least two legs are on the ground at all times and the gait consists of four evenly-timed steps (LH, LF, RH, RF), and on other occasions the term "single-foot" is used to name the hard rack or speed rack (or stepping pace) wherein at very fast speeds there are phases of unipedal support involving a single front hoof on the ground with the rest of the hooves in the air.

Acknowledgments: The author would like to thank Rena Maguire, David Ramey, Stavros Lazaris, and Clothilde Noé for recent discussions on horse gaits.

References

1. Adams, J.N. *Pelagonius and Latin Veterinary Terminology in the Roman Empire*. Brill: Leiden, The Netherlands, 1995. Tripodare and terms for the gait of equine animals; Tolutim; Tripodare, tripodum; pp. 592–601. ISBN 978-90-0410-281-1.
2. Colantuono, S.L.; De Moya, J. 1994. The secret of smooth: The science of paso gaits. *Conquistador* 1994, 4, 41–46.
3. Bennett, D. *Conquerors: The Roots of New World Horsemanship*. Solvang, California, USA: Amigo Publications, 1998. ISBN 978-09-6585-330-9.
4. Agüera, E.; Cruz, J.C.M. Los relieves asirios como fuente de documentación equinotécnica. *Astarté* 2021, 4, 1–11, Figure 1, p. 3 and Figure 3, p. 4.
5. Notes: The "Young Horseman" Relief. *Bulletin of the Metropolitan Museum of Art* 3(3): 61.
6. Hübner, E. 1862. Due bassirilievi Greci nel Palazzo Medinacellia Madrid. *Annali dell'Instituto di corrispondenza archeologica* 34: 101–104 and Pl. F.
7. Hemingway, S.A. 2006. Horse and man in Greek art. *Sculpture Review* 55(2): 8–13.
8. Scherz, S.; Stribling, N. 2017. *The Horse in Ancient Greek Art*. Middleburg, Virginia, USA: National Sporting Library & Museum; p. 64, Figure 49.
9. Johns, C. Exhibits at ballots: Romano-British statuette of a mounted warrior god. *Antiq. J.* 1990, 70, 446–452.
10. Johns, C. *Horses: History, Myth, Art*. Cambridge, Massachusetts, USA: Harvard University Press, 2006; p. 92. ISBN 978-0674-02-323-9.
11. Maguire, R. Our lovely horse. *Archaeol. Ireland*. 2016, 30, 10–12.
12. Maguire, R.; Parker, R. Our lovely horse goes on a Disney adventure. *Archaeol. Ireland.* 2018, 32, 14–16.
13. Sundkvist, A. The horses of the Bayeux Tapestry: Where the art of Roman riding meets the Middle Ages. In *Historical Practices in Horsemanship and Equestrian Sports*, Ropa, A., Dawson, T., Eds.; Trivent Publishing: Budapest, Hungary, 2022; pp. 100–139. ISBN 978-61-5640-562-3.
14. Ruffi, J.C. *Hippiatria*. Seminarii Patavini: Patavii, 1818.

 doi:10.20944/preprints202504.0654.v1

15. Meiers, F. Equestrian cities: The use of riding horses and characteristics of horse husbandry in late medieval urban agglomerations. In *The Horse in Premodern European Culture*; Ropa, A., Dawson, T., Eds.; Walter de Gruyter: Berlin, Germany, 2020; pp. 13–26. ISBN 978-15-0151-818-8.
16. Meiers, F. The wagon rests in winter, the sleigh in summer, the horse never: Practices of interurban travelling on horseback from Antiquity to the Middle Ages. In *Travel, Pilgrimage and Social Interaction from Antiquity to the Middle Ages*; Kuuliala, J., Rantala, J., Eds.; Routledge: London, UK, 2019; pp. 248–269. ISBN 978-03-6713-756-4.
17. Bautier, R.H.; Bautier, A.M. *Contribution à l'histoire du cheval au moyen-âge*. Bibliothèque nationale: Paris, Fraance, 1976.
18. Baigent, F.J. *The Registers of John de Sandole and Rigaud de Assensio, Bishops of Winchester (AD 1316-1323)*. Simpkin and Company: London, UK, 1897; p. 621.
19. Migne, J.P. *Patrologiae Latinae*. Garnier Fratrès: Paris, France, 1862; vol. 97, col. 675C–676A.
20. Bennett, S. The battle of Evesham (1265): Edward Longshanks' first victory on the battlefield. *Med. Warfare* 2012, 2, 42–46.
21. Prévôt, B.; Ribémont, B. *Le cheval en France au Moyen Age.* Paradigme: Orléans, France, 1994.
22. Williams, R. *Selections from the Hengwrt MSS. preserved in the Peniarth Library*. Bernard Quaritch: London, UK, 1892; p. 95.
23. Rops, E. The horse in Welsh and Anglo-Saxon law. In *The Horse in Premodern European Culture*; Ropa, A., Dawson, T., Eds.; Walter de Gruyter: Berlin, Germany, 2020; pp. 205–219. ISBN 978-15-0151-818-8.
24. Hung, Wu. Where are they going? Where did they come from? Hearse and "soul-carriage" in Han Dynasty Tomb Art. *Orientations* 1998, 29, 22–31; Figure 1a-c, and 4, pp. 22–23, and 26.
25. Shi, J. Rolling between burial and shrine: A tale of two chariot processions at Chulan Tomb 2 in Eastern Han China (171 C.E.). *Journal of the American Oriental Society* 2015, 135, 433–452; Figure 3, p. 442.
26. Wallace, Leslie V. A biographical approach to the study of the mounted archer motif during the Han Dynasty. In *Memory and Agency in Ancient China: Shaping the Life History of Objects*. Ed. Francis Allard, Yan Sun, and Kathryn M. Lindhuff. Cambridge, UK: Cambridge University Press, 2018, pp. 197–215; Figure 8.1, p. 199.
27. Cooke, B. *Imperial China: The Art of the Horse in Chinese History*. Lexington, Kentucky, USA: Kentucky Horse Park, 2000; p. 129. ISBN 978-15-6469-071-5.
28. Ramey, D.W. *Lost Traditions: Horses and Horse Medicine in Pre-modern Japan.* David Ramey: Chatsworth, California, USA, 2024. Japanese horse gaits; pp. 41–43. ISBN 979-82-1850-512-7.
29. Liu, Y.K., Fu, W.W., Wang, Z.Y., Pei, S.W., Li, K.H., Wu, W.W., Le, M.Z. and Yue, X.P., 2024. Genomic insights into the genetic diversity, lateral gaits and high-altitude adaptation of Chakouyi (CKY) horses. *J. Genet. Genom.*, 2025, forthcoming.
30. Muybridge, E. *Animals in Motion: An Electro-Photographic Investigation of Consecutive Phases of Animal Progressive Movements*. London, UK: Chapman & Hall, 1902; pp. 93–97, 137–141.
31. Stillman, J.D.B. *The Horse in Motion as Shown by Instantaneous Photography with a Study of Animal Mechanics*. Boston, Massachusetts, USA: James R. Osgood, 1882; pl. 49 and 56.
32. Kobluk, C.N.; Schnurr, D.; Hornèy, F.D.; Sumner-Smith, G.; Willoughby, R.A.; Dekleer, V.; Hearn, T.C. Use of high-speed cinematography and computer generated gait diagrams for the study of equine hindlimb kinematics. *Equine Vet. J.* 21, 1989, 48–58.