Araucaria. Revista Iberoamericana de Filosofía, Política y Humanidades
ISSN: 1575-6823
ISSN: 2340-2199
hermosa@us.es
Universidad de Sevilla
España

Some Thoughts on the Mechanical Features of Pantomime Dancers

Gerolemou, Maria
Some Thoughts on the Mechanical Features of Pantomime Dancers
Araucaria. Revista Iberoamericana de Filosofía, Política y Humanidades, vol. 21, núm. 41, 2019
Universidad de Sevilla, España
Disponible en: https://www.redalyc.org/articulo.oa?id=28265032013

MONOGRÁFICO I

Some Thoughts on the Mechanical Features of Pantomime Dancers

Reflexiones sobre las características mecánicas de los bailarines de pantomima

Maria Gerolemou 1
University of Exeter, Reino Unido

Araucaria. Revista Iberoamericana de Filosofía, Política y Humanidades, vol. 21, núm. 41, 2019

Universidad de Sevilla, España

Recepción: 16 Marzo 2019
Aprobación: 27 Marzo 2019

Redalyc: https://www.redalyc.org/articulo.oa?id=28265032013

Abstract: This paper aims to investigate the kinaesthetic experience of dance, and especially of pantomime dance in Lucian's *De Saltatione* and in Libanius' oration 64, *A Reply To Aristides On Behalf Of The Dancers*, from the perspective of the mechanical. Specifically, pantomime will be discussed in juxtaposition with the concept of mechanical automation. Until now, this aspect remains unexplored; however, this is of great importance, particularly if we take into consideration that from the Hellenistic period onwards theatrical automata and processions with engineered artefacts were considered to be a popular entertainment- mechanism and, as such, they exerted great influence on the public's aesthetic. In this respect, I intend first to survey the concept of pantomimic mimesis as a mechanical reproduction of motion, i.e. gestures and postures. Next, I shall detect the vocabulary of mechanisms/mechanisms' function that is generally embedded in dance rhetoric by examining forced motion both in pantomime and ancient mechanics.

Keywords: automata, pantomime, mimesis, phora, schêma, isxus, katanagkasmos..

Resumen: El presente artículo tiene como objetivo investigar la experiencia cinestésica de la danza, y especialmente de la danza de la pantomima, en *De Saltatione* de Luciano y en la oración 64 de Libanio, *Una respuesta a Aristides en nombre de los bailarines*, desde la perspectiva de la mecánica. En concreto, la pantomima se discutirá en yuxtaposición con el concepto de automatización mecánica, un aspecto hasta aquí inexplorado, pese a su gran importancia, especialmente si se tiene en cuenta que a partir del período helenístico autómatas y procesiones teatrales con artefactos de ingeniería se consideraron un mecanismo de entretenimiento popular y, como tales, ejercieron gran influencia en la estética del público. En este sentido, primero tengo la intención de examinar el concepto de mímesis pantomímica como una reproducción mecánica del movimiento, es decir, gestos y posturas. A continuación, detectaré el vocabulario de la función de mecanismos / función de los mecanismos que generalmente se halla incrustado en la retórica de la danza al examinar el movimiento forzado tanto en la pantomima como en la mecánica antigua.

Palabras clave: autómata, pantomima, mímesis, phora, schêma, isxus, katanagkasmos.

Introduction

This paper aims to offer a preliminary investigation of the kinaesthetic experience of pantomime dance by describing the mechanization or mechanisms of dance movements; [2] with mechanisms of motion, I casually refer both to the 'internal machinery' of pantomime as well as to dance techniques that extend the limits and skills of the dancer's body. The texts on which this analysis relies on are Lucian's De Saltatione and Libanius' oration 64, A Reply To Aristides On Behalf Of The Dancers. Some comparisons will be made between these treatises and mechanical

texts, specifically Heron's Peri automatopoiētikēs and Ps. Aristotle's Mechanica; needless to say, the juxtaposition of Lucian's and Libanius' works on dance with mechanical texts for the present purposes does not aim to override the differences between them; it rather allows me to open a communication path between these texts and thus raise certain issues which, I believe, relate to both.

In defending pantomime dance against impairment of virtue, Lucian's On Dance, which was composed around the middle of the second century, compares pantomime to other technai, such as music, philosophy, oratory, in order to underline the fact that pantomime, like other arts, requires certain somatic and mental capacities, training and knowledge (35, ὅπως δεῖ ἠσκῆσθαι καὶ ἃ μεμαθηκέναι καὶ οἷς κρατύνειν τὸ ἔργον; see the dancer as technitēs, orchēstēs 35-85). [3] In a similar way, Libanius' Oration 64 (4th CE), by enlisting the dance of pantomime among other arts, specifically among the ones that take advantage of technological progress [4] (23-27, 29, 30, such as building, weapon-manufacturing, shipbuilding, bronze work, navigation etc.) without however affecting the physis, nature, of their users (Or. 64. 45-56), [5] tries to disassociate pantomime dancers and those who enjoy such spectacles from the charge of moral depravation put forward by Lucian's contemporary, Aelius Aristides (see also Lucian On Dance 1, 4f.). [6] What is being problematized in these works is the contrast between contemporary pantomime dance, which could harm the audience and the dancers themselves, with earlier forms of dance, which were in harmony with great poetry (see on that esp. Plutarch 748c). While referring to the beauty and naturalness of earlier forms of dance, they argue that pantomime is the result of a development through time which added embellishments to its form; contemporary dance is then considered to be the perfect type of dance as far as poikilia, diversity of expressions, and harmony is concerned (Libanius Or.64.22; Lucian On Dance 7, κατ' ὀλίγον δὲ αὐξανομένη καὶ τῆς πρὸς τὸ βέλτιον ἀεὶ προσθήκης τυγχάνουσα; see further on dance's advance 14, 25, 34). Thus, both works, by comparing pantomime with other technai, and thus by positioning it within a theoretical framework (episteme), promote the idea that a technical reading of pantomime helps to depart from the apprehension that dancers could become morally deprived, due to the fact that modern dance practice and techniques can modify the body and, consequently, the spirit (cf. Libanius' Or. 64.62f. the case of feminine gestures, neumata); in Lucian's wording, 'the most important part of it [sc. in pantomime] is the wisdom behind the action, and the fact that nothing lies outside logic' (On Dance 69, τὸ δὲ μέγιστον ἡ σοφία τῶν δρωμένων καὶ τὸ μηδὲν ἔξω λόγου; see further paragraph 70). [7]

Moreover, as I've briefly mentioned at the outset and will explain further in the next few pages, this technical reading of pantomime intensifies dance experience by focusing on the mechanical properties of pantomime, extends both the capabilities of the dancer's body and, finally, broadens the audiences' aesthetic. It has being already argued that

the notion of orchēsis is generally determined by something mechanical or mechanistic: Kurke, for instance, studies the discourse of choreia and choral habituation in Plato's Republic, Books 1 and 2, as parallel to marionettes and the movement of their joined limbs. [8] Likewise, Timothy Power, in his paper on the Pindaric Celedones (in the eighth Paean), the golden maidens crafted by Hephaestus, draws on the material and engineered qualities of ancient dancing; the singing Celedones are, according to the author, imagined by Pindar as a cyberchorus. [9]

Along the same lines, I intend to discuss pantomime and its movements in juxtaposition with the concept of mechanical kinesis and automation; this, I claim, is of great significance, [10] particularly if we take into consideration that from the Hellenistic period onwards mechanical devices and automata were considered to be a popular entertainment-mechanism in public processions. [11] It appears that just as mechanics stimulated ancient philosophical thinking and explanation, according to Berryman (2009), mechanical motion must have also inspired other examples of movement; in this vein, mechanics could have produced a new reading of performance practice in general and pantomime performance in particular, and, in effect, formed the audience's aesthetic. [12] An experienced audience in engineered artefacts was expected to decode the technical details of pantomime movement, i.e. the programming of the dancer's limbs that made a performance of precise and stylized motion possible. [13] To put it differently, under the light of technological advancements in 'motion industry', matters like how fast one performs a gesture or how tense the body is while executing certain movements started to be important for the audience.

This is probably what is implied in Lucian On Dance 1, when Lucinus accuses his opponent, Crato, of apeiria, inexperience in matters of dance. Plotinus, a philosopher of around the same period, offers an even more illustrative case; by trying to explain the rationality behind the motion of the planets, he brings into the discussion the paradigm of pantomime and its technical explanation; he particularly argues how the latter has changed the role of the viewer/spectator in general; the viewer is now invited to imagine the inner mechanisms of dance performance: In Plotinus's words, a viewer or dance critic would be able to examine the "beat of the feet, the flow of the hands, the fine harmony of gestures" (see further Libanius' Or. 64.57f., and 82), or "how a particular limb of the body is lifted this height for such a configuration, another is bent, another is hidden, a different one is brought low" (Plotinus 4.4.33). [14]

Part of explaining pantomime in mechanical terms is to relate movement- techniques to the internal mechanisms that the body of the dancer incorporates and which, without the former, i.e. without the various techniques, would have remained invisible. What could be only imagined in the viewer's mind, such as shifting identities, madness, [15] etc. could be revealed through pantomime movements. Of course, a brief explanation of a complex subject like this can't help but oversimplify it, however, this is exactly what Lucian On Dance 69 seems to be describing

as the ability of pantomime dancers to show things apparent, like bodily action (energeia), and things unseen, such as dianoia, the intellect (καὶ γὰρ διανοίας ἐπίδειξιν τὰ γιγνόμενα ἔχει καὶ σωματικῆς ἀσκήσεως ἐνέργειαν Lucian On Dance 35, 36, τῶν ἐννοηθέντων ἐξαγορευτικὴ [sc. the art of dance] καὶ τῶν ἀφανῶν σαφηνιστική, 67; see further Athenaeus 1.20e, ἡ Πυλάδου ὄρχησις ὀγκώδης παθητική τε καὶ πολυπρόσωπος). [16] That is to say, not only the mask and costume, as Wyles argues, [17] are responsible for denoting character change in pantomime but also the mechanisms behind dance steps. This is made even more explicit by both Lucian and Libanius when they discuss role changing by pinpointing the parameter of kinesis, τάχος, speed, or σφοδρότης and συντονία, vehemence as key factors in shape-role-shifting transformation, for instance, in relation to the paradigm of the Egyptian Proteus (Or. 64. 28, 117, Lucian, On Dance 19). More precisely, Lucian in On Dance 19 and 73, by contrasting realistic dance techniques which enhance the 'strength' and 'flexibility' of the dancers' limbs, to the way the myth describes e.g. Proteus' transformation ability, Heracles' power and Aprhodite's daintiness as a paradoxon, once again, rescues the technical 'dignity' of pantomime. [18]

A reading of pantomime within the framework of mechanical or technological advancements implies that the dancer generates a hybrid corporeality which not only confounds the boundaries between the perceptual and the unconscious but, most importantly, between the human and the artificial. [19] Similarly to the automata, which in Heron's Peri automatopoiētikēs are described as concealing the strings/mechanisms that determine their movements (cf. Aut. 20.2. 5-12), pantomime dancers display a disconnection between the mind and body while their movements seem to be governed by an innate or external faculty, which the audience, like in the case of Heron's theatrical automata and their strings, cannot see. The fact that a hidden force is identified behind motion, in both automata and pantomime dancers, creates, however, the need this to be presented to the audience in an intelligible way so that the viewers would be able to perceive the unseen mechanisms without the help of an expert who would have explained how movement and posture are realised (see also Lucian, On Dance 36, ἑρμηνείαν δὲ νῦν τὴν σαφήνειαν τῶν σχημάτων λέγω, 62, [...] σαφήνειαν ἀσκεῖν, ὡς ἕκσαστον τῶν δεικνυμένων ὑπ᾽ αὐτοῦ δηλοῦσθαι μηδενὸς ἐξηγητοῦ δεόμενον, 64, σαφῶς ὀρχούμενον ...). Referring to the cause of automatic motion Heron, for instance, while he rejects an obvious manipulated motion produced by an engineer who lacks the necessary skills to initiate motion without the audience noticing (Aut. 20.2. 5-12), [20] insists that the audience must be aware of the counter-intuitive effect produced by the motion of inanimate matter, which, in the case of the automata, is based on engineering developed by a craftsman (Aut. 1.7). As a consequence of this mechanical explanation, the astonishment caused by both the dancer's postures and the automaton's motion and action is not threatening to the audience's clear perception (Lucian On Dance 71, 73,

77 83, 85 and Heron Aut. 1.7 [21]); it is rather indicative of the viewer's understanding of how a skilful mechanism functions.

Finally, dancing movements are considered to depend on the flexibility and endurance of the dancers' trained limbs; this is also reminiscent of the mechanical automata. Heron of Alexandria dictates the types of material that should be used, in order to ensure the proper function of the automata; specifically, in Aut. 2.2, he states that mobile automata, in order to move easily, should be made out of light and dried-out wood and their limbs out of horn (24.1). The body of the pantomime dancer is also treated as inanimate material: for instance, it is presented as made of wax (Libanius, Or. 64.104). According to Lucian and Libanius, pantomime dancers are 'made' by flexible, almost liquid, ὑγρά 'materials' in order to bend easily (On Dance 73; Libanius Or. 64. 104; on the flexibility and agility of limbs see also Lucian On Dance 71, 77f. and Libanius Or. 64.118). Moreover, their body must be of a perfect physical type, moderate height and not plum, a straight neck, not furtive look and well-formed finger and body (On Dance 75, Libanius 64. 103, 106f.).

The remaining part of this essay is structured as follows: First, I propose to survey pantomimic mimesis as providing a mechanical reproduction of motion. Next, I shall detect the vocabulary of mechanisms/mechanisms' function that is generally embedded in dance rhetoric by examining forced motion both in pantomime and ancient mechanics. [22]

Mimesis, phora, schema, isxus

Before turning to pantomimic dance, it is important to note that, generally, the idea of dance as an imitative practice was first introduced by Plato in Laws 795e; in this work, Plato notes that we have two kinds of dancing: the first one, choral dance, is the outcome of imitating the style of the Muse. This kind of dancing preserves freedom and nobility (megaloprepeia); the other one, which refers merely to the physical aspect of dance, aims at fitness, flexibility of limbs, lightness and beauty of the dancer's body (see further, e.g. 654aff. 672e-673d, 813b).

Differently from Plato's idea of mimesis, both as imitation and performance, whose quality depends mainly on moral features, like virtue and courage, impersonated by the performer and by the object of imitation, technological mimesis in general and mimesis in a pantomimic context in particular is not determined by such standards. Technological advances of the Hellenistic and Imperial period led to a rapid paradigm shift in the notion of mimesis as well; by having devices that allowed to experience e.g. planets by proxy and in ways that could not be done naturally, [23] relocated the discussion about mimesis from the moral characteristics of the imitator and of what is being imitated to the skills of the medium of imitation. In this vein, mimesis depends on the acknowledgement of the fact that, for instance, a pantomimic performance is merely the result of a technosomatic procedure that forces the dancer's body to 'suffer' modification and, as such, while, in a way, it

may torture the body, it also negates the accusations associated with the traditional type of mimesis, like deception, maliciousness or illusion.

As Lucian puts it, two different types of techno-mimesis can be achieved with respective types of training: a. First, certain training could help the body become flexible and light (On Dance 73) and thus able to change its form and produce graceful limbs and harmonius movement (Lucian On Dance 25, 71, 81-2); in the second case, exaggerated training has a negative effect on body and dance; it can generate "disproportionate stature" (Lucian On Dance 27) or "senseless movements" (Lucian On Dance 80, ἄλογα κινούμενοι); generally, it can lead to kakozêlia (Lucian On Dance 82, 81-3) or kakomousia, unfortunate imitation as termed by Plutarch in a discussion on dance and its relationship to poetry (748c). [24] Galen, in Adhortatio ad artes addiscendas, makes a similar point when he refers to the kakotechnia, bad art, or mataiotechnia, useless art of athletics, due to the excessive training of the athlete's body done in vain (9); according to Galen, kakotechnites could be tricksters, i.e. acrobats, [25] Schlapbach notes (2018, 127) that, in contrast to Philodemus (1st ce BC), who, in his Rhetoric, refers inter alia to theatrical genres as examples of kakotechnia (Philodemus, De rhetorica 2, col. 30, p. 107, 25–35 ed. Longo Auricchio), Galen omits such a reference here. Moreover, his depiction of pantomime dance movements in De sanitate tuenda 2.11 as an automatism, i.e. as something that dancers don't consciously think about but produce spontaneously, does not exclude the possibility that he considers pantomime dance to rather belong to the cases of eutechnia, skilful art. Nevertheless, on automatisms as related to the technê of pantomime, I will return later in this paper.

Dancing as mimetic art is further defined through two features: phora and schêma. In Plutarch's last problem in his Quaestiones Convivales, there are actually three: schêma, phora and deixis. The first two are considered to be highly imitative, while the third one indicates what is acted on stage, i.e. in reality. Specifically, schêma imitates form (morphê) and appearance (idea), while phora, i.e. motion, ends in a schêma, posture (see Plutarch 747c φορὰς μὲν οὖν τὰς κινήσεις ὀνομάζουσι, σχήματα δὲ τὰς σχέσεις καὶ διαθέσεις, εἰς ἃς φερόμεναι τελευτῶσιν αἱ κινήσεις). [26] Exaggerated mimicry could change the appropriate phora of the dancer, i.e. it might result in senseless phora, that will consequently affect the proper schêma, dance posture that is dictated by the story. As said by Lucian, though he does not directly uses the term phora, if a dancer does not move his feet according to the rhythm or in the right time (not μετάχρονα ἢ πρόχρονα), then, there is good chance that the final schêma differs from what the story presents and demands (see e.g. paragraphs 17 and 19 on schêma and mimesis); in the same way, Heron's theatrical automata are forced to adjust their mechanical movements to the mythos that is being performed (1.5, ἐὰν ἀπαιτῇ ὁ μῦθος).

In case of exaggerated mimesis and, in effect, inappropriate phora, a dancer could easily confuse roles and postures, for instance, to present, instead of Cronus eating his children, Thyestes performing a similar action. In another example, in On Dance 83, Lucian refers to a dancer

who "in presenting Ajax going mad immediately after his defeat, he so overleaped himself that it might well have been thought that instead of feigning madness he was himself insane; for he tore the clothes of one of the men that beat time with the iron shoe, and snatching a flute from one of the accompanists, with a vigorous blow he cracked the crown of Odysseus, who was standing near and exulting in his victory". [27]

The issue of phora is attested with greater emphasis in the works of the engineers, and specifically of Heron of Alexandria; here, although the term functions as a synonym to natural kinesis and is not directly associated with schêma, [28] it is pictured as a power incorporated in matter, which under certain circumstances could change its disposition, (Heron Spir. 1 proem. 98, καίτοι παρὰ φύσιν τῆς φορᾶς ἄνω γενομένης τῷ ὑγρῷ, 1.1.18, here, the phora is contrary to nature for water is described as risen up, see further 1.2.81, 1.10.4, 2.13.30; see also Ar. Phys. 230 b 10 ff. and Pappos, Mathematical Collection 8.1).

In contrast to 'bad' mimesis that could change the phora of the limb's motion and destroy the appropriate schêma, a mimesis that produces habitual movements, is considered to be harmonious and skilful (eutechnos). As Webb argues, Libanius presents this habitual character of pantomimic mimesis as a kind of body memory that enables dancers to dance without thinking about their steps (cf. above Galen, De Sanitate tuenda 2.11). [29] The notion of automaticity or the habituation that defines 'good pantomimic mimesis' becomes even more clear if we compare once again the pantomime dancer with the theatrical automaton described in Heron's Peri automatopoiētikēs. In this case, the function of the automata is also based on mechanisms and motion which induces unwelcome excitation and, through repetition, secures the familiarity of the performed story. This supposition naturally raises the question whether the mechanized dancer manifests a concealed lack of will and, of course, whether dance is subject to mechanical determination.

As already argued above, motion, in both automata and pantomime dance, results from an artificial procedure, training (which is related to both bad and good mimesis); due to this, motion is generally described as the product of katanagkazein [30] (see Libanius Or. 64. 104 especially on cyclical motion, [31] see also 105) or of an isxus, external power (Lucian On Dance 71), which work against the natural inclination of body limbs. [32] Defined in such terms, dancing movements are unavoidably subject to the discussions on the character of mechanical motion (para physin or kata physin) best described in the ps. Arist. Mech. 849a14-16. [33] At first glance, the pantomime motion since it is produced from an outer force (which is not an integral part of the body of the dancer), it should generally be considered as unnatural and thus amousos, not according to the Muse, i.e. incongruous. However, and though outer powers appear to force the body to take a different inclination than expected, pantomime movements are considered to be eumousoi, skilled in the art, eurythmoi, rhythmical, euschêmones, elegant in figure, euarmostoi, harmonious, eumorfoi, symmetrical, summetroi, consistent etc (see e.g. Lucian On

Dance 25, 81; Libanius Or. 64.28, 57, 97). According to van Leeuwen, in the ps. Aristotelean text of the Mechanica, it is the specific properties of an object that determine what can be considered to be natural; [34] in the same way, I believe, forced motion in pantomime can be characterized as natural and harmonius exactly because it is brought into line with the dance's overall schêma, which, as we have seen above, depends on the story that is being performed and derives from the phora of the limbs. This is why, in Or. 64. 59f., Libanius argues that one cannot be corrupted by pantomime dance movements, even if the limbs during the dance are forced to bent (kamptontai) and twist (klôntai) in a way that seems unnatural and give the sense of being directed by an external force.

To offer a brief concluding remark, it appears that the technical reading of pantomime as this is attested both in Lucian and Libanius while, it reveals a kind of enslavement of the dancer's body through a machine-like movement, at the same time, it promises virtue, freedom and autonomy exactly through the naturalization of this forced motion.

Bibliography:

Armstrong 1984: A.H. Armstrong, Plotinus, Vol. IV and V (Ennead iv and Ennead v). (Loeb Classical Library) (Cambridge, Mass, 1984).

Asper 2007: M. Asper, Griechische Wissenschaftstexte. Formen, Funktionen, Differenzierungsgeschichten (Stuttgart, 2007).

Asper 2013: M. Asper, Making Up Progress—in Ancient Greek Science Writing [in Asper, M., coord.: Writing Science. Mathematical and Medical Authorship in Ancient Greece. Science, Technology and Medicine in Ancient Cultures 1, Berlin 2013] pp. 411-430.

Asper 2019: M. Asper, Rhetorik als Literatur. Streifzüge durch Handbücher [in Tornau C., Erler, M., coord.: Handbuch Antike Rhetorik, Berlin 2019], pp. 655-674.

Berryman 2003: S. Berryman, Ancient Automata and Mechanical Explanation [in Phronesis 48.4, 2003], pp. 344-369.

Berryman 2009: S. Berryman, The Mechanical Hypothesis in Ancient Greed Natural Philosophy (Cambridge, 2009).

Bielfeldt 2014: R. Bielfeldt, Gegenwart und Vergegenwärtigung: dynamische Dinge im Ausgang von Homer [in Bielfeldt R., coord.: Ding und Mensch in der Antike, Heidelberg, 2014], pp. 15-48.

Birringer 2008: J. Birringer, *Performance, Technology and Science* (New York, 2008).

Butler, Purves 2013: S. Butler, A. Purves, coord.: *Synaesthesia and the Ancient Senses* (Durham, 2013).

De Groot 2014: J. De Groot, *Aristotle's Empiricism: Experience and Mechanics in the Fourth Century BC* (Las Vegas 2014).

De Groot 2016: J. De Groot, Motion and Energy [in Irby, G. L., coord.: *A Companion to Science, Technology, and Medicine in Greece and Rome*, 2 vols, Chichester and Malden MA, 2016], pp. 43-59.

Dodds 1973: E. R. Dodds, The ancient concept of progress and other essays on Greek literature and belief (Oxford, 1973).

Edelstein 1967: L. Edelstein, The idea of progress in classical antiquity (Baltimore, 1967).

Fo#gen 2005: Th. Fo#gen, coord.: Antike Fachtexte – Ancient Technical Texts (Berlin & New York 2005).

Fo#gen 2009: Th. Fo#gen, Wissen, Kommunikation und Selbstdarstellung. Zur Struktur und Charakteristik römischer Fachtexte der fru#hen Kaiserzeit (Zetemata, Band 134) (Munich 2009).

Gerolemou, forthcoming: M. Gerolemou, Automatic Theatre: Distinguishing Technology and Humanity in Ancient Greek Drama (London, forthcoming).

Hall 2013: E. Hall, Pantomime: visualising myth in the Roman Empire [in Harrison, G. W.M., Liapis, V., coord.: Performance in Greek and Roman Theatre, Leiden, 2013] pp. 451-473.

Harmon 1936: A.M. Harmon, Lucian, Vol. V. (Loeb Classical Library) (Cambridge, Mass, 1936).

Huß 2001: W. Huß, Ägypten in hellenistischer Zeit: 332–30 v. Chr. (Munich, 2001).

Krafft 1967: F. Krafft, Die Anfänge einer theoretischen Mechanik und die Wandlung ihrer Stellung zur Wissenschaft von der Natur [in Beitra#ge zur Geschichte der Wissenschaft und Technik 9, 1967] pp. 12-34.

Kurke 2013: L. Kurke, Imagining Chorality: Wonder, Plato's Puppets, and Moving Statues [in Peponi A.-E., coord.: Performance and Culture in Plato's Laws, Cambridge, 2013], pp. 123-170.

Lada-Richards 2007: I. Lada-Richards, Silent Eloquence: Lucian and Pantomime Dancing (London, 2007).

Marshall 2003: C. W. Marshall, Sophocles' Nauplius and Heron of Alexandria's Mechanical Theatre [in Sommerstein A. H., coord.: Shards from Kolonos: Studies in Sophoclean Fragments. Vol. 34, Bari, 2003], pp. 261- 79.

Micheli 1995: G. Micheli, Le origini del concetto di macchina (Florence, 1995).

Miller 1951: J. L. Miller, Measures of wisdom: the cosmic dance in classical and Christian antiquity (Toronto, 1951)

Ni Mheallaigh, forthcoming: K. Ni Mheallaigh, Reflections on Lucian's lunar mirror: speculum lunae and an ancient telescopic fantasy [in Gerolemou, M. and Diamantopoulou, L., coord.: Mirrors and Mirroring from Antiquity to the Early Modern, London, forthcoming]

Ni Mheallaigh, forthcoming: K. Ni Mheallaigh, The Moon in the Greek and Roman imagination: selenography in myth, literature, science and philosophy (Cambridge, forthcoming).

Porter 2010: J. I. Porter, The Origins of Aesthetic Thought in Ancient Greece: Matter, Sensation, and Experience (Cambridge, 2010).

Power 2011: T. Power, Cyberchorus: Pindar's Κηληδόνες and the aura of the artificial [in L. Athanassaki, L., Bowie, E., coord.: Archaic and Classical Choral Song: Performance, Politics and Dissemination. Trends in Classics, Berlin, 2011], pp. 67-113.

Rice 1983: E.E. Rice, The grand procession of Ptolemy Philadelphus (Oxford,1983).

Rihll 2018: T. Rihll, Mechanics and Pneumatics in the Classical World [in Keyser, P. T., Scarborough, J, coord.: Oxford Handbook of Science and Medicine in the Classical World, Oxford, 2018], pp. 337-358.

Roby 2016: Roby, C., Technical Ekphrasis in Greek and Roman Science and Literature. The written machine between Alexandria and Rome (Cambridge, 2016).

Roby 2017: Framing technologies in Hero and Ptolemy [in Squire, M., Platt, V., coord: The Frame in Classical Art: A Cultural History, Cambridge, 2017], pp. 514-543.

Schiefsky 2007: M. J. Schiefsky, Art and Nature in Anceint Mechanics [in Bensaude-Vincent B., Newman W., coord.: The Artificial and the Natural: An Evolving Polarity, Cambridge, MA, 2007], pp. 67-108.

Schiefsky 2009: M. Schiefsky, Structures of argument and concepts of force in the Aristotelian Mechanical Problems [in Early Science and Medicine 14, 2009], pp. 43-67.

Schlapbach 2018: K. Schlapbach, The Anatomy of Dance Discourse: Literary and Philosophical Approaches to Dance in the later Graeco-Roman World (Oxford; New York, 2018).

Schürmann 1991: A. Schürmann, Griechische Mechanik und Antike Gesellschaft (Stuttgart, 1991).

Slaney, Foka, Bocksberger 2018: H. Slaney, A. Foka, S. Bocksberger, Ghosts in the Machine: an Experiment in Distributed Reception [in Digital Humanities Quarterly 12:3, 2018].

Steiner, forthcoming: Steiner, D., More than a thing: figuring hybridity in archaic poetry and art [in Gerolemou, M., Kazantzidis, G., coord: The Body as Machine in Antiquity: Towards an early History of Iatromechanics, Cambridge, forthcoming].

Taub & Doody 2009: L. C. Taub, A. Doody, coord.: Authorial Voices in Greco-Roman Technical Writing (Trier, 2009).

Taub 2002: L. Taub, Instruments of Alexandrian Astronomy: The Uses of the Equinoctial Rings [in Tuplin C.J. and Rihll T.E., coord.: Science and Mathematics in Ancient Greek Culture, Oxford, 2002], pp. 133–149.

Van der Eijk, 1997: Ph. Van der Eijk, Towards a rhetoric of ancient scientific discourse: Some formal characteristics of Greek medical and philosophical texts (Hippocratic Corpus, Aristotle) [in Bakker E.J., coord: Grammar as Interpretation. Greek Literature in its Linguistic Contexts (Mnemosyne Supplement No. 171), Leiden, 1997], pp. 77–129.

Van Leeuwen 2016: J. van Leeuwen, The Aristotelian Mechanics: Text and Diagrams (Berlin, 2016).

Wälchli 2003: P. Wälchli, Studien zu den literarischen Beziehungen zwischen Plutarch und Lukian (Leipzig, 2003).

Webb 2008a: R. Webb, Demons and Dancers: Performance in Late Antiquity (Cambridge, Mass., 2008).

Webb 2008b: R. Webb, "Inside the Mask: Pantomime from the Performers› Perspective›, [in Hall, E., Wyles, R., coord.: New Directions in Ancient Pantomime, Oxford, 2008], pp. 43-60.

Wyles 2007: R. Wyles, The Stage Life of Costume in Euripides' Telephus, Heracles and Andromeda; An Aspect of Performance Reception withtin Graeco-Roman Antiquity, [London, 2007; unpublished phd thesis, accessed at http://www.apgrd.ox.ac.uk/library/item/13897 <16 March 2019>].

Notes

[**2**] De Groot 2014: ch. 3, names it kinesthetic awareness see esp. p. 56: This is "[...] is human awareness, held consciously or unconsciously, of how to leverage mechanical forces by means of one's own body. The awareness is "kinesthetic" because it is action taken in response to movement underway. Inevitably, exertion of muscular force is involved".

[**3**] Schlapbach 2018: 125.

[**4**]On this type of progress see Asper 2013. See further Edelstein 1967 and Dodds 1973: 1-25 citing Seneca's 90th letter where the latter expresses his disgust on this kind of development of practical skills (house building, milling); though cf. his enthusiasm on progress regarding 'pure science' in Nat. Q. 6.5.3; 7.30.5, Letters 64.7 (Dodds, p. 23 and Edelstein 169-77).

[**5**] Schlapbach 2018: 129.

[**6**] Schlapbach 2018: 128

[**7**]Trans. by Harmon 1936.

[**8**] Kurke 2013.

[**9**] Power 2011; see further: Foka and Bocksberger 2018, in an article on the digital reconstruction of roman pantomime they try to enliven the technicity foregrounding the kinaesthetic procedure of this type of dance.

[**10**]See Webb 2008a and 2008b suggesting also a, mechanical, character for pantomime dance by drawing a parallel with the South Indian Kathakali form of dance.

[**11**]See for example the pompê of Ptolemy Philadelphus and the automaton of Nyssa (described by Kallixeinos FGrHist 627 F 2); on that see Huß 2001: 321-3; Rice 1983: 62-6; Cf. further Schürmann 1991: ch. 4 and 5; Rihl 2018: esp. 352. Referring specifically to Lucian, Karen Ni Mheallaigh in her forthcoming book on the moon in Lucian and elsewhere and in a chapter on the mirror and the moon in Lucian's VH introduces the term 'scientific imagination' to describe Lucian's technological phantasies which seem to reflect the technological realities of his own time. See further on that Wälchli 2003 and Bielfeldt 2014: 205.

[**12**]Gerolemou forthcoming; see further Birringer 2008. My inquiry into the impact of engineering process and automata upon the spectator of pantomime builds upon recent work such as Porter's aesthetics of matter (2010) and Butler's and Purves' 2013 sensory perception in ancient Greece.

[**13**]See Plotinus 4.4.33 as cited by Schlapbach 2018: 144 and Webb 2008a: 89.

[**14**]Trans. by Armstrong 1984.

[**15**]See esp. on Heracles' madness, Macrobius' Saturnalia 2.7.16f.

[**16**]See Lada-Richrards 2007: 51-3 with further sources.

[**17**] Hall 2013: 465.

[**18**]On this see Lada-Richards 2007: 51.

[**19**] Lada-Richards 2007: 75f.

[**20**]See also Aut. 9.5, 13.9, 17.1, 30.6; Spir. 1.32, 1.29; on this see Marshall 2003; Berryman 2003: 361. Cf. further Arist. Mech. praef. 848a 34-37, ταύτην οὖν λαβόντες ὑπάρχουσαν ἐν τῷ κύκλῳ τὴν φύσιν οἱ δημιουργοὶ κατασκευάζουσιν ὄργανον κρύπτοντες τὴν ἀρχήν, ὅπως ᾖ τοῦ μηχανήματος φανερὸν μόνον τὸ θαυμαστόν, τὸ δ' αἴτιον ἄδηλον.

[**21**]ἐκάλουν δὲ οἱ παλαιοὶ τοὺς τὰ τοιαῦτα δημιουργοῦντας θαυματουργοὺς διὰ τὸ ἔκπληκτον τῆς θεωρίας, the ancients called the creators of such things "wonder-makers" because of the surprising effect of the spectacle; see further Athenaeus, Mech. p. 31 W. = p. 58 W.-B, on a strange device ascribed to Ctesibius, γενναίου δὲ τοῦτο ἄξιον οὐθενός, ἀλλ' ἐκ θαυμάτων τὸ μηχάνημα συγκεί- μενον καὶ μάλιστα τὸν τεχνίτην τὸ θαυμάσαι. Pappus, a mathematician of the fourth century CE, calls engineers θαυμασιουργοί, wonder-makers who wish to trick their ignorant observers by trying to imitate the natural movement of animated beings and classifies them into two categories: those who generate wonders through air, cords and sinews, which includes Heron, and those who create wonders through flowing water (in Synagoge 8.1024, 24-30). See further on thaumatopoiike# as a field of engineering Proclus In Prim. Eucl. Elem., 41.3 ff. ed. Friedlein. On astonishment and machines, see Asper 2016: 41-3; Roby 2016: 46, 78, 266 and Roby 2017.

[**22**]On the rhetoric of technical texts see among others van der Eijk 1997; Fo#gen 2005, 2009; Asper 2007, 2019; Taub and Doody 2009.

[**23**] See Taub 2002 on instruments of Alexandrian astronomy; on the moon and the mirror see Ni Mheallaigh, forthcoming.

[**24**]Cf. Xenophon's Symposion 2.17: here Socrates contrast the disproportionate bodies of the athletes with the natural bodies of the dancers.

[**25**]On dancing and acrobatics see Lada-Richards 2007: 31f. Generally, athletics, acrobatics and other body modification techniques in antiquity seem to share both terminology and moral dilemmas concerning the limits of this artificial modification; see on that Lada-Richards 2007: 89-93.

[**26**]See further Seneca Ep. 121.6, Mirari solemus saltandi peritosquod in omnem significationem rerum et adfectuum parata illorum est manuset uerborum uelocitatem gestus adsequitur

[**27**]Trans. by Harmon 1936.

[**28**]Phora appears many times in the Aristotelean corpus and denotes natural movement, see e.g. De Caelo, 300b, ἔστι καὶ κίνησις κατὰ φύσιν, ἡ εἰς τοῦτον τὸν τόπον φορά. See also Phys. 243b.

[**29**] Webb 2008b: 54: "The process of training that Libanius describes would have produced performers whose movements were so thoroughly ingrained in their bodies that they no longer needed to think consciously about each movement". See also Webb 2008a: 92f.

[**30**]Plotinus in 4.4.33 describes the way the limbs of the one performing the dance are being transformed under the necessity (ἐξ ἀνάγκης) of the various dance figures (schêmata and schêmatismoi).

[**31**]ἐπειδὰν δὲ ἐργάσηται τὸ σῶμα κύκλον, ὥσπερ τινὰ λύγον, κινεῖ πρὸς δρόμον οἷα τροχόν, τὸ δὲ θεῖ. See further on this Webb 2008a: 68, 140. Heron following the advancements in technology, he states that he will not only speak about the linear movement of the automata but also about the cyclical Aut. 5.2, see also Aut. 7.1ff. on the cyclical motion of the automaton. See also Wyles 2007 refers to the cyclical orchêsis scene in Iliad 18.599–601 compared to the motion the wheel of a potter; see also on that, Steiner in forthcoming paper. The simplicity and naturalness of rotation is attested both in Plato Timaeus 39ff. and in Laws 898a4-5 898b1-2 through the rotational motion that characterizes heavenly bodies; see on the notion of cosmic dance Miller 1951.

[**32**]On isxus in Aristotle see Kraft 1967: 24; Micheli 1995: 64f.; De Groot 2014, 24 and De Groot 2016: 51f.

[**33**]On the character of kata physin and para physin motion, see Schiefsky 2007 and 2009, 57; he argues that para physin should be interpreted as constrained motion while

kata physin as free motion. See also on this Micheli 1995, 64f. and van Leeuwen 2016, 12-18.

[**34**]2016, 16-18.

Notas de autor

1 (M.Gerolemou@exeter.ac.uk) Maria Gerolemou is the Leventis post-doc fellow at the Classics and Ancient History Department of the University of Exeter. Her research focuses on ancient Greek drama, Wunderkultur and, most recently, ancient sciences. She is the author of the book Bad Women, Mad Women: Gender und Wahnsinn in der Griechischen Tragödie (2011) and the editor of the collective volumes Recognizing Miracles in Antiquity and Beyond (De Gruyter, 2018) and Mirrors and Mirroring: From Antiquity to the Early Modern Period (with L. Diamantopoulou, Bloomsbury, forthcoming 2019). She is now preparing a book on ancient drama and technology (Automatic Theatre: Distinguishing Technology and Humanity, Bloomsbury Academic, 2020) and works on the collective volume, The Body as Machine in Antiquity: Towards an early History of Iatromechanics (with G. Kazantzidis).