

LIVING MACHINES IN THE EARLY STUART COURT

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Abstract. This short paper is in response to Lily Filson's essay in this collection. It engages with the insertion of automata into a higher environmental sphere, with a distinct view on their embodiment and 'macrocosmic' features. Such an approach emphasizes the relation between pneumatic technology and courtly power; finally, the essay also reflects on epistolary reports as a way to store social performance.

Keywords: English masque, Cornelis Drebbel, embodiment, Stuart court

Introduction

In "Reformation England and the Performance of Wonder: Automata Technology and the Transfer of Power from Church to State," Lily Filson describes how secular automata of the early Stuart court took on the supernatural mantle of pre-Reformation church automata. Automata, particularly in the context of the court masque and garden, were rendered Orphic. Members of the court appeared, as Filson puts it, "in the ceremonial role as Hermetic god-makers, privy to the secrets of investing inanimate matter with life from the stars." By removing automata from the church and repositioning them within courtly spectacles, the Reformation did not secularize machinery so much as allow its forces to seep from it in many directions, including into the staging and demonstration of the preternatural powers of kingship.

Automata display in courtly masques and gardens were participatory. Such participation between mechanical beings and human counterparts cut two ways. On the one hand, it points to how automata were not seen necessarily as dead things, but as vital machines, participating in the world of the living. Jessica Riskin has argued that the vogue for "frolicsome engines" in gardens suggests "not people as rote automata but machines as responsively alive."¹ On the other, it shows how humans too had power to engage the animating forces of machinery. Access to power by engaging the pneumatic forces of automata is central to Filson's argument. As she notes, "[m]agical philosophy and pneumatic engineering alike rely on the force of the unseen but manifestly powerful air, which as a concept was only beginning to become divorced from the metaphysical idea of spirit."

Machines in the garden

Garden machinery actively engaged its audience, reacting to their presence and spritefully spraying them with cold water or revealing wondrous optical

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phenomena. One of the most famous vital machines of the period, mentioned by Filson, was Cornelis Drebbel's perpetual motion installed in the garden of Eltham Palace. It was part of a wide array of automata Drebbel built there between 1607 and 1610 before voyaging on to Prague to work on similar devices for Rudolf II. Cornelis Drebbel's specialty was his use of meteoric phenomena, and in particular, heat from the sun, to power his machinery, thus connecting them to larger theories about the function of fire in the microcosm. This was why he claimed that his celebrated perpetual motion was "living" and "grafted" onto nature.²

I purposefully use the term "perpetual motion" (as a direct translation of *eeuwighe beweging* and *motus perpetuus*) rather than "perpetual motion machine" to describe Drebbel's device, since what mattered to Drebbel was not the mechanical structure to which the motion was attached, but the motion itself, which was not mechanical. Our phrasing "perpetual motion machine" identifies perpetual motion as a mechanical devices. Yet, as Drebbel explained in a letter dedicating the device to King James I in 1607, the machine might well break, but the motion would continue, since it was based on the unending motion of the macrocosm. All one had to do was replace the broken mechanism, and the motion would continue.³ Although our commonsense notions of perpetual motion today would exclude motions driven by larger macrocosmic forces, that was not necessarily the case in contemporary terms.⁴

Even Drebbel's colleague, Salomon de Caus (1576-1626), who is often cast as a supreme adherent to a mechanized view of nature, conceded to the fashion for vitalist perpetual motions dependent upon the actions of the elements. Like many other writers of the period De Caus distinguished between "material" and "elementary" fire. The latter, the heat of the Sun, nourished all other activity and was the "true natural light." He at first claimed that man cannot create perpetual motion, a denial of its possibility that is often cited.⁵ Less often cited are de Caus' next remarks, in which he proposes to "set aside" that claim and to demonstrate a machine that "acts on its own" as long as "it is maintained by the four elements from which it is composed." A copper ball, floating on top of the liquid in a thermoscope would rise and fall as the weather changed, and a little cord could be attached between the ball, a pulley, and a counterweight, whose motion could turn a shaft affixed to a dial that could be divided into 12 parts. Thus, in an adaptation of other clocks run by the flow of water, the changing motion of the water in the thermoscope could be rendered metric and used to power the motion of a dial.⁶ This would have been a perpetual motion, if only the water within did not need to be changed every fortnight.⁷

Some readers considered de Caus in such remarks as promoting a notion of a motion enmeshed within the elements. An enthusiastic promoter of perpetual motion, Daniel Mögling, praised de Caus for acknowledging the role of the four elements in all sorts of machines. It is through the elements that machines have not only their body (*corpus*) but their motion (*motum*).⁸

Many visitors to Eltham recorded their impressions of Drebbel's display and their on-site interlocation with its inventor. One such visitor was Georg von Schwartzstät, Baron of Offenbach, who wrote about his experience in a travel journal now in the Folger Library. von Schwartzstät visited while Drebbel was already away in Prague working for Rudolf II, and thus does not seem to have met Drebbel in person.

His little known account, however, offers additional details about the state of the perpetual motion a few years after its original installment and how it was being expanded into a larger, solar-powered multimedia display.

We saw a perpetual motion machine the like to which time past has not seen, nor does any other region see it now. It is a globe made out of brass to the size of a human head, showing the course of the Sun, of the Moon, of the planets, the months and days and many other things, continuously and by its own proper motion; nor is the machine aided by any hand but, the maker declares, it will resemble in enduring convolution the eternal heaven. Around the globe there is a concave shell of glass which graphically shows the ebb and flow of the Ocean. The sea rising, water from the lowest part surges into the top part. It ebbing, this gradually subsides. Such a work, but greater in size, this same man is making for the Lord our Emperor [Rudolf II]. And there is there a maiden made by singular artifice who, the Sun striking her with his rays, sings to a clavichord, and a cloud obscuring the sun, she is silent immediately. We did not see this for it had been taken to pieces. It was reported that this maiden was about to be placed under a little roof which had a perennial fountain and this, the sun coming out above, would send up water from four little pipes to the height of a man's stature. The designer is Dutch by birth, most experienced in Astronomy and the secrets of nature.⁹

This account confirms Drebbel's descriptions of how he had expanded on his perpetual motion while in Prague and planned to continue to develop it once he had returned to England. In one letter to King James now in the British library, he described the musical instrument as in need of further development.¹⁰ when completed, it would be reckoned "among the miracles of the world." In another undated letter found in a 1631 copy in the diary of Isaac Beeckman, Drebbel informed King James that while away in Prague in the service of the late Emperor Rudolf, he had perfected the instrument.¹¹ Now, when the sun shone, his instrument emitted light and music, with the curtains and the doors of the instrument opening by themselves, and closing themselves whenever the sun was again covered with clouds. To that instrument he joined a well with two springs. When the sun shone, a hundred more streams suddenly streamed forth, with Neptune emerging from a rock followed by Tritons and marine Goddesses. A glass full of water rose and fell so punctually that one could use it to tell the time. When the sun clouded over or set, the bubbling springs died down, except for the original two, and Neptune and his troop departed, as if mourning the absence of the sun. Also, in sunlight, Phoebus emerged, playing on

his cythara, seated on his aerial chariot, whose wheels moved. When the sun was overcast, Phoebus hid. All of this was accomplished by the rays of the sun alone, although one could also initiate them by touching a small glass with a hot hand. Similar descriptions of Drebbel's grotto design were also published.¹²

Drebbel's perpetual motions were interactive in more ways than one. They were situated in garden settings, where they reacted to the same solar and meteoric phenomena as the garden plants themselves. Moreover, they could respond directly to the touch of a warm hand. To contemporary eyes, garden automata were akin to the responsive plants found in period gardens. Wonderful plants such as the heliotrope or sunflower followed the motions of the sun. Otherwise, like the mimosa, so named because it mimicked being alive, responded to touch or to heat.¹³ Such plants might be even incorporated into automata, such as Athanasius Kircher's heliotropicon or "sunflower clock," which purported to tell the time according to the movement of a flower following the sun (although Peiresc was disappointed by a 1633 demonstration of its effects).¹⁴ Like machines powered by heat, water and air, such plants called into question the nature of the ambient environment, its relationship to astral powers, its effects upon the human body, and its potential for manipulation by humans.

As Filson discusses, masque designers staging the power of the court drew upon the human potential to interact with and manipulate living machinery. The interactive theatricality of the garden and the masque made them more similar spaces than they might appear to be to us today. Both allowed spectators to play a role in the drama of natural forces at play. A reference to Drebbel's perpetual motion and its interactivity appeared early on in a 1609 skit by Ben Jonson newly rediscovered in 1996.

The "Entertainment at Britain's Burse," celebrated the opening of the New Exchange, and was written at the urging and under the supervision of Robert Cecil (1563-1612), James I's secretary of state; King James and Queen Anne apparently attended the performance.¹⁵ The skit outfitted the Master of Exchange as a hawker of wares, making the typical extravagant claims of shopkeepers; at the performance, however, in a display of conspicuous consumption typical for court performances, he dispensed actual, priceless *Kunstammer* objects dispensed upon the audience as though they were mere baubles.

Through these objects, the Master competed against "my Antaganist at eltham," that is Drebbel. His objects were distinctly Drebbelian, although whether they were actually made by Drebbel himself are unclear. He had, for example, "an Instrument that hath in it the figures of the sunn & moone, a Clocke, and other excellent propertyes, ye will saye I ame a daedalus ere I have doen too, naye I assuer ye it plays alone without the helpe of a second."¹⁶ He also had a singing statue of Apollo, that could he claimed, compete with such pneumatically driven phenomena as the statue of Memnon. This, in fact a human performer, came to life on the stage. As was typical of the Orphic logic of court performances, Jonson cast the ultimate cause of the Apollo's vitality the harmony of the King and Queen The royal pair, "Gaynste natuers lawe," had the "power to touch/ The dullest earth, and make <s> it such/As I ame nowe." The Master wished that "my Antaganist at eltham wer heer nowe to

heare what he would say,” claiming that the wonder of the moving, magical Apollo far surpassed “the heat of handes or the beames of the sunn.”¹⁷

Conclusion

This competition between the suddenly vivified Apollo with Drebbel’s responsive perpetual motion itself, suggests the ways in which the display at Eltham was understood as a participatory display of royal preternatural power.

The interaction of machinery and pneumatic forces denied a divide between dead mechanism and the living environment. Rather, it staged courtly bodies within an ambient environment of powerful macrocosmic forces, in which human and artificial bodies might interact. Such participatory displays, asking courtly spectators to contribute their breath or bodily warmth, was a common trope. A case in point is Viscount Doncaster’s Essex House Masque of 1621, in which the giants of the earth attempt to revolt against heaven. Pallas transmutes them into stone, but then Prometheus, with the help of his fire and audience participation, transforms them back into men. Prometheus describes his fire as “lifes matereall, temper’d so/ By skilfull handlinge” that it can bestow all natural virtues. Much like Drebbel’s machinery, which invited participants to warm it and set it in motion with the touch of their hands, the masque audience was urged to breath upon the stage, and thereby to “Ad to the fire/Which your breathinges must fan higher/ Life to renew.”¹⁸

References

- ¹ Jessica Riskin, *The Restless Clock: A History of the Centuries-Long Argument over What Makes Living Things Tick* (Chicago: University of Chicago Press, 2016), 43.
- ² Vera Keller, “Drebbel’s Living Instruments, Hartmann’s Microcosm and Libavius’ Thelesmos: Epistemic Machines before Descartes,” *History of Science* 48:1 (2010), 39–74.
- ³ Drebbel to James, *Advocates Manuscripts*, National Library of Scotland, Adv.MS.33.1.1, “Primo, me hanc machinam appellare perpetuum mobile, hanc ob rem, quot quotidiana experientia animadvertam in ea agitationem, nullo beneficio ponderis, circumvoluti chalybis, aut alterius cujuscunque auxili; sed ex sempiterna causa quae neque perit neque peribit, nisi verbo Dei, ut majestati tuae notum. Movere anim absque his subsidiis, majestati tuae antehac ostendi, quam similiter non fallit causam motus aeternam esse. . . . Causa enim motus aeterna est, neque unquam cessat. Si rotula una atque altera consumatur, substituaturs alia, et denuo movebitur.”
- ⁴ Alan Gabbey, “The mechanical philosophy and its problems: Mechanical Explanations, Impenetrability, and Perpetual Motion,” *Change and Progress in Modern Science*, ed. Joseph C. Pitt. (Dordrecht: D. Reidel, 1985), 9-84.
- ⁵ eg. Luke Morgan, “Garden Design and Experience in Shakespeare’s England,” *The Oxford Handbook of the Age of Shakespeare*, ed. R. Malcom Smuts (Oxford: Oxford University Press, 2016).
- ⁶ Salomon de Caus, *Les raisons des forces mouvantes* (Frankfurt: Norton, 1615), 18r-19v.
- ⁷ Katja Grillner, “To See the World as a Limited Whole: Human and Divine perspectives in the work of Salomon de Caus,” *Chora 3: Intervals in the Philosophy of Architecture*, Albert Pérez-Gómez and Stephen Parcell, eds. (Montreal: McGill-Queen’s University Press, 1999) 79-102; 93.

Salomon de Caus, *Les raisons des forces mouvantes* (Frankfurt: Norton, 1615), Book I, Problem XII, "Pour faire une Machine, laquelle aura mouvement de soy-mesme."

⁸ Daniel Mögling [Valerius Saledinus], *Perpetuum Mobile, Das ist: Immerwehrende Bewegung* (Frankfurt: Jennis, 1625), 23.

⁹ Folger MS 1837.1. Cited in. G. P. V. Akgrigg, "England in 1609," *Huntington Library Quarterly* 14:1 (1950), 75-94; 92-93.

¹⁰ British Library, Harleian MS 7011, folio 56.

¹¹ C. de Waard, ed, *Journal tenu par Isaac Beeckman de 1604 à 1634*. Vol. 3: 1627-1634 (1635), 439. Daniel Mögling (1625), *Perpetuum Mobile*, 28-9.

¹² Georg Phillip Harsdörffer, *Deliciae Mathematicae et Physicae* (Nürnberg: Endter, 1677), 399-400.

¹³ Guido Giglioni, "Touch Me Not: Sense and Sensibility in Early Modern Botany," *Early Science and Medicine* 23 (2018) 420-443.

¹⁴ Thomas Hankins and Robert Silverman, "Athanasius Kircher's Sunflower Clock," *Instruments and the Imagination* (Princeton: Princeton University Press, 1995), 14-36.

¹⁵ James Knowles, "Jonson's *Entertainment at Britain's Burse*," *Re-presenting Ben Jonson: Text, History, Performance*, ed. Martin Butler (London: Palgrave Macmillan, 1999), 114-151. James Knowles, "The Entertainment at Britain's Burse: Textual Essay." *The Cambridge Edition of the Works of Ben Jonson Online*. ©Cambridge University Press, 2014. Cited October 22, 2018.

¹⁶ Knowles, "Jonson's *Entertainment at Britain's Burse*," 139.

¹⁷ Knowles, "Jonson's *Entertainment at Britain's Burse*," 139-140.

¹⁸ Timothy Raylor, *The Essex House Masque of 1621: Viscount Doncaster and the Jacobean Masque* (Pittsburgh: Duquesne University Press, 2000).