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**Clock Watchers and Stargazers: Berlin's
Clocks Between Science, State and The
Public Sphere at the Eighteenth
Century's End**

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Abstract

This article argues that modern time discipline was a product of the eighteenth-century. Whereas other works have emphasized the integration of time through nineteenth-century railway networks, this article holds that science and the state combined to bring discipline to time well before the railway arrived. Central to this was a change in the way time was defined. During the late eighteenth- and early nineteenth centuries, in places such as Geneva, London, Berlin, and Paris, people stopped reckoning time by the sun and followed an independent standard defined by scientists. This article uses Berlin's experience with public clocks to show how this shift began within science and was completed only after city governments enforced it. It further argues that the Berlin government's role in defining time highlights a change in how knowledge was produced in late eighteenth-century Europe. Science created new approaches to the world, but the state confirmed these approaches as knowledge. In this respect, the "discipline" in time discipline only became a fact, when science and the state defined the knowledge on which it was based.

Resumen

El presente artículo argumenta que el estudio moderno del tiempo es un producto del siglo XVIII. En tanto otros trabajos han enfatizado la integración del tiempo mediante las redes ferroviarias en el siglo XIX, este artículo sostiene que la ciencia y el estado se combinaron para dar disciplina al tiempo mucho antes que el ferrocarril llegase. El elemento fundamental del cambio se cifró en cómo se definía el tiempo. Al final del siglo XVIII e inicios del XIX, en ciudades como Ginebra, Londres, Berlín y París, las personas dejaron de calcular la hora a través de la posición del sol y siguieron un estándar definido por científicos. Este artículo usa la experiencia de Berlín con relojes públicos para demostrar como este cambio inició en la ciencia misma, y sólo se completó después que el gobierno de la ciudad lo volviera obligatorio. Se argumenta, además, que el papel desempeñado por el gobierno de Berlín en la definición del tiempo destaca un cambio en como el conocimiento científico se producía en la Europa de finales del siglo XVIII. La ciencia creó nuevas aproximaciones al mundo, pero fue el estado quien confirmó estas aproximaciones como conocimiento. A este respecto, la "disciplina" en la disciplina del tiempo sólo se convirtió en un hecho cuando ciencia y estado definieron el conocimiento en que se basaba.

Introduction

On August 23, 1787 Ewald von Hertzberg, Curator of the Prussian Royal Academy of Sciences, celebrated Frederick William the Second's birthday with a speech to the Academy.¹ Hertzberg praised the spirit of reform that the new King had brought to Prussia and, in keeping with it, announced:

measures to have a clever clockmaker install...in the Academy's Grand Hall a clock, which our intelligent astronomer, Herr Bode, will set daily according to the true meridian, so that all city clocks can subsequently be set by it.²

The clock was installed in October 1787, just above the Academy's main entrance, and rapidly gained favor among Berliners, who flocked to it to check their pocket watches. Figure 1 depicts the clock as it appeared in the late eighteenth century. Although it seems innocuous, the clock heralded a fundamental change in the structures of public knowledge: science had staked its claim to determine time's foundations.

A signpost of science's growing prestige, the Academy clock became central to Berlin's public life. In 1822, Heinrich Heine (1797-1856) highlighted the clock, while describing a scene along Unter den Linden:

It's barely noon, the time when the beautiful people go for a walk. The well-groomed masses move up and down the Linden. You wonder that all the men stop here suddenly, reach into their pockets, and look up? My dear fellow, we are standing exactly before the Academy clock, which is the most accurate of all Berlin's clocks, and each passerby takes the chance to set his watch by it. It is a comical site, if one does not know that a clock sits up there.³

In 1787, the clock had been an expression of practical reform by one of Berlin's elite; forty years later, it was an institution in the city's daily life.

Historians have overlooked the Academy clock, but its history opens a new window onto eighteenth-century science's role in daily life. Perched in the Academy's edifice, it became a conduit for diffusing among the public what Norton Wise has called "the values of precision."⁴ As Wise has argued, the public embraced accuracy as an intrinsic value, because of eighteenth-century science's burgeoning prestige. The Academy clock suggests, however, that

1. Ewald Friedrich von Hertzberg, *Historische Nachricht von dem ersten Regierungs-Jahre Friedrich Wilhelm II. Königs von Preussen*, vorgelesen in der öffentlichen Versammlung der Akademie den 23. August 1787 (Berlin, 1787).

2. Hertzberg, *Historische Nachricht*, 19.

3. Heinrich Heine, *Historisch-kritische Gesamtausgabe der Werke*, ed. Manfred Windfuhr (Hamburg, 1973), 6:14.

4. See the editor's introduction in M. Norton Wise, ed., *The Values of Precision* (Princeton, NJ, 1995). For a discussion of precision's culturally constructed nature, see Kathryn M. Olesko, "The Meaning of Precision: The Exact Sensibility in Early Nineteenth-Century Germany," in Wise, ed., *The Values of Precision*, 103-134.

the diffusion of values was more tortuous and contested than has been presumed. The clock was a public scientific instrument and it diffused scientific values among the populace. As we will see, however, this very publicness invited disagreement about time. As a result, by the late eighteenth century, the Academy clock actually incorporated two competing definitions.⁵

The clock's historical importance lies in the irony that it was too accurate to be a public timekeeper. Berlin functioned according to "true time," which was based on the sun's daily journey. Under this system, the day began with sunrise and ended at sunset. Noon was the midpoint between them, and the period was divided into twelve equal hours. However, since the elapsed time between sunrise and sunset changed throughout the year, the hour's length waxed and waned. The Academy clock was, by contrast, expressly designed for "mean time." Here the earth's annual orbit was divided into equal units, and scientists determined the "correct" time by calculating the earth's position along its orbital path.

Science's shift from solar to astronomical time had public consequences. A clock that accurately marked mean time's equal units could never be reliably "accurate" for someone raised on true time. This happened in Berlin, where a critical public expected the clock to represent the sun's time accurately because it was "scientific," even though the science and technology behind the clock defined accuracy differently.⁶ Of course, no mechanical clock had ever accurately represented true time in Berlin, and the city's older turret clocks were notoriously irregular. The Academy clock highlights, therefore, the role public expectations played in determining accuracy's meaning in Berlin. Before 1787, people complained about their churches' turret clocks, but they did not expect them to be truly accurate, since they knew their mechanisms worked poorly. After 1787, however, Berliners expected the Academy clock to be exact, because its mechanism had a reputation for regularity and scientists set it. Nonetheless, the public's expectations and the Academy of Sciences' practices remained mutually incompatible, a situation that finally changed in 1810, when Berlin's city magistrates put the city on "mean time" and declared that the Academy clock was to be the city's master clock.⁷ In the end, state power joined with institutional science to alter permanently the foundations of public knowledge.

In this article I intend to highlight time as an overlooked aspect of the early-modern public sphere. Until now, historians have understood the public

5. On the nature of public scientific instruments, see Jan Golinski, "Barometers of Change: Meteorological Instruments as Machines of Enlightenment," in William Clark, Jan Golinski and Simon Schaffer, ed., *The Sciences in Enlightened Europe* (Chicago and London, 1999), 70-93.

6. Klaus-Harro Tiemann, "'Pro musis et mulis' - das erste Akademiegebäude," *Spectrum: Berliner Journal Für Den Wissenschaftler* (1991): 42-44.

7. Gerhard Dohrn-van Rossum, *History of the Hour: Clocks and Modern Temporal Orders* (Chicago, 1996), 346.

sphere mostly in terms of print and sociability.⁸ Yet time was a public issue before the print and social spheres became prominent. In Berlin, the populace had become critical of its public clocks already in the seventeenth century, and during the eighteenth century time even became a public good, consumed and critiqued every day by an informed public. Moreover, by that century's end, Berliners no longer got the time for practical purposes; they checked the time in order to be seen checking the time. Put another way, a shift in the values associated with time created new public rituals of time gathering.

I do not mean to argue by this that public surveillance of public clocks was the same thing as reading a newspaper in a coffee shop or debating issues in Freemasonic lodges. I am arguing, however, that public clocks open a window onto an underappreciated aspect of publicness, namely the constant demand by city dwellers in the German states for greater public utility. This is the flipside of what Marc Raeff has called the "well-ordered police state."⁹ In seeking to improve life for their subjects, monarchical states in Germany necessarily submitted their efforts to public review, and the failure to provide promised services became the subject of commentary. This is not to say that an incipient form of democracy beckoned in late eighteenth-century Germany, and especially not in Prussia, but to show how daily city life spurred new forms of debate and criticism, all of which must be included in a broad conception of the public sphere.

Finally, the Academy clock suggests new ways of understanding time discipline. Until recently, E. P. Thompson's article, "Time, Work-Discipline, and Industrial Capitalism," has set the historical agenda.¹⁰ According to Thompson, capitalism shifted labor's rhythms from task orientation, with

8. The fundamental text in this literature is Jürgen Habermas, *The Structural Transformation of the Public Sphere: an Inquiry into a Category of Bourgeois Society* (Cambridge, Mass., 1989). For introductions to the debate, see B. Nathans, "Habermas' Public-Sphere in the Era of the French-Revolution," *French Historical Studies* 16 (1990): 620-644, Margaret C. Jacob, "The Enlightenment Redefined: The Formation of Modern Civil Society," *Social Research* 58 (1991): 475-495, Craig J. Calhoun, *Habermas and the Public Sphere* (Cambridge, Mass., 1992), Dena Goodman, "Public Sphere and Private Life - Toward a Synthesis of Current Historiographical Approaches to the Old Regime," *History and Theory* 31 (1992): 1-20, Anthony J. La Vopa, "Conceiving a Public: Ideas and Society in Eighteenth-Century Europe," *Journal of Modern History* 64 (1992): 98-115, and Harold Mah, "Phantasies of the Public Sphere," *Journal of Modern History* 72 (2000): 153-182. Stuart Sherman has pointed out how important changes in clock technology were to people's conceptions of literary time. Stuart Sherman, *Telling Time: Clocks, Diaries, and English diurnal form, 1660-1785* (Chicago, 1996).

9. Marc Raeff, "The Well-Ordered Police State and the Development of Modernity in Seventeenth- and Eighteenth-Century Europe: An Attempt at a Comparative Approach," *American Historical Review* 80 (1975): 1221-1243; Marc Raeff, *The Well-Ordered Police State: Social and Institutional Change through Law in the Germanies and Russia, 1600-1800* (New Haven, 1983).

10. E. P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present* 38 (1967): 56-97; Paul Glennie and Nigel Thrift, "Reworking E. P. Thompson's 'Time, Work-Discipline, and Industrial Capitalism,'" *Time & Society* 5 (1996): 275-299. On clocks and time in general see David S. Landes, *Revolution in Time: Clocks and the Making of the Modern World*. (Cambridge, Mass., 1983), and Otto Mayr, *Authority, Liberty, & Automatic Machinery in Early Modern Europe* (Baltimore, 1986). See also Igor A. Jenzen and Reinhard Glasemann, *Uhrzeiten: die Geschichte der Uhr und ihres Gebrauchs*. (Frankfurt am Main, 1989) for a look at Germany, though one that heavily emphasizes Frankfurt.

workers putting in hours sufficient only to complete a given task, to a “time discipline” enforced by the factory whistle.¹¹ Thompson’s argument once appeared broadly applicable, because it submerged time discipline within capitalism’s rise. Scholars have contested this explanation, however, arguing that time discipline did not spread uniformly with capitalism, but appeared in different places, at different times, and for many reasons.¹² We must, therefore, rethink time discipline’s nature. Berlin offers a unique opportunity to do so, because it reveals that until very late time discipline was a two-way street, with people disciplining clocks as much as clocks were disciplining people. Seen from this perspective, Berlin’s experience suggests that time discipline was part of larger processes of disciplining that historians such as Norbert Elias, Michel Foucault, and Gerhard Oestreich have outlined.¹³ What I hope to show is that clocks may not simply have created a new form of discipline--in many ways, discipline created clocks.

Against this backdrop, this essay examines Berlin’s experience with public clocks between 1676 and 1811. It makes two broad arguments about public time regimes. First, public time standards must be understood as a community of knowledge. How time functioned was a product of negotiations among power groups capable of determining what knowledge was. In Berlin, the groups involved included the church, local government, the public, clockmakers, and scientists. As the power groups changed, and as the relationship between them changed, the substance of time changed with them. This arrangement also included a significant gender component, as these groups were made up largely of men. It is not certain how much influence women wielded during the period I have outlined, but as I will argue below, women must have lost all influence over public time standards by the end of the eighteenth century. Second, the key moment in time’s evolution came when the state ratified science’s claims to define time; that is, recognizably modern time sense became public knowledge through a marriage between science and state power.

I.- The Origins of Berlin’s Public Time.

This section pursues three basic themes. First, it traces how the understanding of temporal accuracy changed between the seventeenth- and eighteenth centuries. Berliners’ interest in accurate time dated back to the

11. Thompson, “Time, Work-Discipline, and Industrial Capitalism,” 60-61.

12. Glennie and Thrift, “Reworking E. P. Thompson’s ‘Time, Work-Discipline, and Industrial Capitalism,’” 276.

13. On discipline and disciplining in early-modern Europe, see Norbert Elias, *The Civilizing Process* (Oxford, 1994); Norbert Elias, *The Court Society* (New York, 1983); Michel Foucault, *Discipline and Punish: the Birth of the Prison* (New York, 1977); Michel Foucault, *The Order of Things: an Archaeology of the Human Sciences* (London, 1970); Gerhard Oestreich, *Neostoicism and the Early Modern State*, ed. Brigitta Oestreich and H. G. Koenigsberger (Cambridge, 1982); Also important are Raeff, “The Well-Ordered Police State”; Raeff, *The Well-Ordered Police State*.

seventeenth century, but their understanding of it changed significantly. Second, it explores how the power structure and the city's temporal topography shaped Berlin's time regime. As the power structure and the infrastructure of time changed, so too did time's definition. Third, it considers how time created a public. During the end of the seventeenth- and into the eighteenth century, Berliners monitored, relied on, and complained about their city clocks. As the surveilling public became larger, time became more public, and the public more critical.

Throughout the seventeenth century, Berlin's time was suspended between three local authorities. The first was the royal court. It set the city's temporal standards by ratifying the sun as Berlin's master clock and ordering that all clocks be set by it. The second authority was the church. Most public clocks were in churches, and each consistory individually managed its own clock. The third was Berlin's emerging public. This public played a key role, because it "owned" Berlin's turret clocks through its reliance on them. A fruitful tension arose: Berliners' surveillance evaluated each clock's time, as well as the authority behind it.

We must also recognize, however, that Berlin's time coalesced within the city's topography. That is, where clocks were and how well (or badly) they worked structured temporal experience. (Later, this will include pocket watches and pendules.) Until late in the eighteenth century public clocks were generally located in church turrets.¹⁴ Early-modern Berlin had few public clocks, and the majority was in church towers. Since churches were central to life in Berlin, turret clocks also became central.¹⁵ Berlin's most important clock resided in its most prominent church, the Domkirche. Located next to the Stadtschloss, the royal residence, the Domkirche was at Berlin's geographic center and closely linked to the court.¹⁶ It was, thus, ideally positioned to radiate time and the authority associated with it to the city's other churches. These churches, the Böhmisches Kirche, the Dreifaltigkeits Kirche, the Friedrichswerdersche Kirche, the Georgenkirche, the Grauen-Kloster-Kirche, and the Parochialkirche, comprised the balance of Berlin's temporal infrastructure, sending the Domkirche's time outward from the city's center.¹⁷

14. The files covering the Domkirche's career as Berlin's master clock are rich, but problematic. Largely management records of daily maintenance, scheduling repairs, and paying bills, none of the papers specifically covers the people's experience. They do, however, provide a reflection, albeit distorted, of public attitudes toward time in Berlin. Subtle changes in the language used are, I believe, reflective of general changes in Berliners' understanding of public time. We may not be able to get the true voice of the people from these sources, but we can gain insight into their world by examining the thoughts of those who listened carefully. Brandenburg Landeshauptarchiv (hereafter LHA), Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller; Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 209 Anstellung der Domuhrsteller (1773-1858).

15. Jürgen Boeckh, *Alt-Berliner Stadtkirchen*, vol. I (Berlin, 1986), 9-10; Gerhard König, *Uhren und Uhrmacherei in Berlin: Geschichte der Berliner Uhren und Uhrmacher 1450-1900* (Berlin, 1988).

16. Boeckh, *Alt-Berliner Stadtkirchen*, vol. I, 87-128.

17. For a discussion of the individual churches' histories, see Boeckh, *Alt-Berliner Stadtkirchen*, vol. I, and Boeckh, *Alt-Berliner Stadtkirchen*, vol. II (Berlin 1986). These churches are the only ones to be named as sources of

This system of turret clocks made time largely an aural experience. The various churches were close to each other, which meant that people could often hear more than one clock ringing. (This probably included the royal household itself, since the Domkirche and another church with a turret clock, the Marienkirche, were near the Stadtschloss.) Moreover, the era's technological limitations gave Berliners little reason to consult their turret clocks directly. Most public clocks lacked a minute hand and their irregularity was well known.¹⁸ Finally, although people could compare clocks to sundials, such comparisons only worked on sunny days, which left people with their turret clocks' bells.¹⁹ All these factors combined to make time a world of sound that was roughly defined by the sun, but which was mediated through a host of local authorities.

The local leadership's management of Berlin's public clocks betrays this basic structure and aesthetic. In 1679, Elector Frederick William I ("the Great Elector") ordered that all the city's turret clocks be set by the Domkirche:

Following his royal highness' determination that the bells in this city ring dissimilarly, and in response to the many complaints caused by the resulting confusion, which has meant that one does not know which clock to follow...we order the magistrates in Berlin, Cölln, and Friedrichswerder graciously and, at the same time, earnestly to make arrangements for setting all clocks uniformly by the Domkirche, so that all disorder is prevented.²⁰

This royal intervention encapsulates Berlin's temporal order in the seventeenth century. First, the court established a central clock. Second, it recognized time's aural basis; it was not inaccuracy per se, but the asynchronous ringing of the city's church bells that caused public confusion. Finally, it assumed a public that relied on public clocks to organize its affairs.

The Elector's edict pointed to stricter controls over public clocks. For example, three years before the edict's publication, Martin Krüger, the Domkirche's clock setter, fell ill.²¹ Michael Kresten, another local clockmaker, immediately wrote to the consistory asking for Krüger's

public time in the archival records, in spite of at least one other important church, the Marienkirche having a tower and a turret clock. This had a turret clock by 1666, but it never appears in the sources as a public clock subject to state management. This may be because the clock was not a very good one. See, the discussions in Berlin-Brandenburgische Akademie der Wissenschaften (hereafter BBAW) BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Offizianten.

18. On the limitations of these old mechanisms, see David S. Landes, *Revolution in Time*, 83-84.

19. König, *Uhren und Uhrmacherei*, 51. Sundials played an important public role throughout the eighteenth century. For the importance of sound to daily life, see Alain Corbin, *Village Bells: Sound and Meaning in the Nineteenth-Century French Countryside* (New York, 1998).

20. Geheimes Staatsarchiv Preussischer Kulturbesitz (hereafter GSta PK), I. HA Rep. 9, N7, Fasc. 1, Uhrmacher 1661-1702, 13rv. Also quoted in König, *Uhren und Uhrmacherei*, 27.

21. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, (unpaginated) 4 April 1676.

position temporarily and for the permanent position, should he die.²² The consistory approved the request with a marginal note on Kresten's petition. By 1711, however, when Andreas Heldt petitioned the consistory for the newly vacant clock setter's position, things had changed. Rather than approving the request with a note, the consistory required Heldt to sign a written contract.²³

The Domkirche's first clock-setting contract highlights Berlin's early temporal order. It had only seven provisions, some of which are mundane, such as the third, which required the contractor to lock the church's door before leaving.²⁴ Nonetheless, the second and the fifth provisions suggest how royal policy anchored time's context. The second required the clock setter to:

Set the clock daily by the sundial, or in foggy weather by the clock according to which his Royal Majesty's clocks are set, so that the city's other clocks can be set accordingly.²⁵

This quote reveals a tension that runs through Berlin's temporal experience. Time was constructed from multiple and, occasionally, competing authorities. Although the sun was Berlin's official timekeeper, its authority actually flowed from the royal court. On sunny days, people referred to the Domkirche, which had the court's sanction, but on cloudy days, which are not uncommon in Berlin, the Elector's clocks determined the city's time.

The Hohenzollern court played an important role in shaping public perceptions of time. It was both a cultural and political authority. On the one hand, it made clocks fashionable, stimulating a market for specialty manufacturers, which then slowly produced items for a consumer market.²⁶ On the other hand, it also oversaw public time standards. This dual role may appear innocuous, but it set an important dynamic in motion. As clocks left the court and entered the general public, their meaning began to change. The Domkirche contract's fifth provision suggests one way of understanding the changes. It specified that the clock setter:

must check on the clock every Sunday before the sermons and set the same correctly, even when it appears unnecessary, and keep everything in good order.²⁷

22. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, 4 April 1676.

23. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, 20 October 1711.

24. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, 11 December 1711.

25. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, 11 December 1711.

26. On Frederick II's role in Berlin's clock industry, see Alfred Chapuis, *Le Grand Frédéric et ses Horlogers* (Lausanne, 1938). For Berlin in general see Herzfeld, *Preussische Manufakturen*, 219-224 and König, *Uhren und Uhrmacherei*, 22-53.

27. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, 11 December 1711.

This quote provides a glimpse of time's multi-contextual nature. Berlin's official master clock was located in a church turret, which made it a public object, but one that was associated with religion. Initially it had an officially religious purpose, but it also became inherently public through the service it provided during the rest of the week. Thus, although the court and the church determined public time's form, the public redefined its use, since it used the clock every day.

The Domkirche's turret clock suggests two propositions that will guide the rest of this essay. First, public clocks existed in social space, which although defined by the court and the church, encouraged new social practices. Consider figure 3, which depicts the second Domkirche.²⁸ Note that clock looks out onto a public space, which made public surveillance inevitable. Berlin's public clocks were always in tension: a clock's location invested it with meaning, while the public's use of the clock invested that location with new meanings. This leads to the second proposition. Although public space was circumscribed by a power structure, it was also inherently contested through daily activity. The royal court and the church provided an important backdrop to time, while people's practices redefined it.

Before continuing, we must consider the public sphere's composition. Identifying the public is a difficult problem, since the archival sources usually speak of a collective entity (*das Publikum*). The best that we can say for the period between 1676 and 1750 is that the public was most likely composed of men who relied on turret clocks and were in a position to complain about any deficiencies. These men were probably either members of Berlin's business elite, or were artisans who began and ended their days by the peals of certain bells.²⁹ It is not clear what role women played, but as I will show below, if women had any influence, they could not have retained it by the eighteenth century's end. As both the infrastructure and the aesthetic of time changed—moving from the aural to a visual realm, from church turrets to the Academy of Sciences—Berlin's women lost the ability to critique their public clocks.

28. The first Domkirche was demolished in 1740 and was replaced with the church depicted in figure 3. The second Domkirche was, in turn, demolished in 1893, to make room for the monstrosity that currently resides there. On the Domkirche's history, see Jürgen Boeckh, *Alt-Berliner Kirchen* (Berlin, 1975). On Berlin's turret clocks in general, see König, *Uhren und Uhrmacherei*, 51.

29. David Landes has noted that medieval artisans already fixed the length of their workday by local turret clocks' bells. Landes, *Revolution in Time*, 75. E.P. Thompson puts this phenomenon much later. (Thompson, "Time, Work-Discipline, and Industrial Capitalism.") Although I have not found any records of similar disputes in Berlin, the city did have quite a few manufactories in which artisans worked. See Herzfeld, *Preussische Manufakturen* for a broad overview of artisanal work in early-modern Berlin.

II.- Public Clocks and the Public Sphere.

Berlin's system of turret clocks created a social and physical topography within which a time-minded public germinated. In the beginning, this public experienced time aurally, judging Berlin's public clocks mostly by their respective bells. During the first half of the eighteenth century, however, the public became critical in a new way. Driven in part by tastes at the Prussian court, pendules and pocket watches became both popular and affordable.³⁰ Pendules began to appear in bourgeois homes, providing a private place for displaying public time. The new pocket watches, however, were crucial to public time's evolution. In addition to being cheap and accurate, these watches showed time reliably down to the minute. This change in technology pushed time into a visual sphere. Now many more people had a critical reference point that required them to use their eyes, rather than simply their ears.

By the middle of the eighteenth century, a critical public of watch owners consumed public time regularly. This made public clocks more important and motivated clock makers to vie for the advertising that public contracts offered. Over the years, with each clock setter's death or dismissal, the competition became more intense. In 1743, for example, Samuel Gottlieb Leopold tried a novel approach in his pursuit of the Domkirche's vacant position, arguing in his application letter that Berlin's public clocks should all be set by one man (himself, naturally) and citing a 1738 report by city government as evidence:³¹

This written report of January 8, 1738 assumed and confirmed that it would contribute greatly to accuracy, were the city's and suburban clocks, as well as the Domkirche's clock maintained and set regularly by a single person, so that they could all run on the same time or at least have the Domkirche's clock run accurately, and, moreover, have them all ring together...³²

Leopold's strategy highlights two important issues. First, accuracy was still defined relationally and aurally; the primary concern was to have the clocks ring together. Second, the mention of both city and the suburban clocks reveals how daily practice generated additional oversight. Having all of Berlin's bells ring together only made sense if a public demanded synchronicity.

By the second half of the eighteenth century Berlin's temporal public was in full bloom. Carl Ludewig Buschberg, a local manufacturer who held the title

30. König, *Uhren und Uhrmacherei*, 47-53.

31. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, 24 January 1743. Leopold was later named Stadtuhrmacher, which meant he set the clocks that the city magistracy owned.

32. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller, 24 January 1743.

of City Clock Maker (Stadtuhrmacher) provides an example. As Stadtuhrmacher he already maintained and set the city government's clocks, which were located in Berlin's various town halls. In 1776, Buschberg tried to steal the clock setting job at the Domkirche by impugning the incumbent, Peter Pohlmann. In a letter to the consistory, Buschberg charged that people on the street were blaming him personally for the clock's poor performance, even though he was not maintaining it. He wrote:

Because as is generally known the daily military parades [Wachparaden] are executed near the cathedral, and the cathedral clock's inaccuracy was often imputed to me...³³

We cannot judge Buschberg's veracity, though the tale is plausible. In any event, the ploy failed, and Buschberg had to wait until 1778 to get the job. Nonetheless, were his story completely fabricated, it is important that Buschberg cited the public's dissatisfaction in his letter, since it reveals that public opinion had become important to public time.³⁴

Buschberg's mention of military parades offers another perspective on how power structured public perceptions of time.³⁵ Military parades were part of Berlin's daily routine, as they occurred at certain times and followed a certain rhythm. If we consider the royal court's role during the seventeenth century, the nature of state influence over time had begun to change. Under Frederick William, "the Great Elector" and his son, Frederick I/III, public time became an important local issue, but it was not yet as powerful a force as it would later be. As Frederick William I and Frederick II increased the military's public profile, time became more disciplinary. Karl Friedrich von Klöden, a Prussian Junker born in 1786 and who grew up in Berlin, offers some insight into how people's values were affected:

At the time, there was, however, more to the height of elegance in a sergeant than his uniform. He had to carry a silver watch in each pocket from which a silver chain dangled visibly. To compliment a sergeant with the envious phrase "He has a silver watch in each pocket" meant that he was a paragon among sergeants, and one could be sure that he would be promoted before long. Punctuality was considered a cardinal virtue in a

33. Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 209 Anstellung der Domuhrsteller (1773-1858), 12 January 1776.

34. Pohlmann kept his job until 1778, when an undisclosed crisis caused him to leave town. The sources do not explain this disappearance, telling us only that he fled (von hier entwichen). Buschberg immediately exploited the situation. Pohlmann's wife (her full name does not appear in the sources) took over the shop, signing her name on correspondence as "Pohlmannin Uhrmacherin." Unable to do her husband's work, she hired Buschberg to care for the Domkirche, which Buschberg reported to the consistory. The consistory then fired Mrs. Pohlmann, and on April 13, 1778, Carl Ludewig Buschberg became the Domkirche's newest clock setter. (Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 209 Anstellung der Domuhrsteller (1773-1858), 2 April 1778.)

35. Two classic discussions of the militarization of German state and society are Otto Büsch, *Military System and Social Life in Old Regime Prussia, 1713-1807: the Beginning of the Social Militarization of Prusso-German Society* (Atlantic Highlands, N.J., 1997). and Hans Rosenberg, *Bureaucracy, Aristocracy, and Autocracy; the Prussian Experience, 1660-1815* (Cambridge, Mass., 1958).

soldier, and since a single pocket watch ran inaccurately after a while, the soldier who acquired a second watch proved how much punctuality meant to him and, thereby, the extent to which he was a virtuous fellow. Of course, the envious asserted that many of the soldiers attached one end of these silver chains to potatoes they carried in their pockets, especially since it was common to pawn at least one of the watches. This was, however, only supposition.³⁶

Klöden's recollections point out how important the military was to the development of punctuality. But punctuality is only possible if accuracy has already become an issue. We must recall here that Klöden was born in 1786, which meant his recollections could not pre-date the Academy clock's arrival. What this suggests is that military time was not simply translated into the public's time. In fact, it was the public's debate about accuracy that made military punctuality possible, so we need to recognize an interplay between the military and the public over time. Berlin's parades were a public event, and with the Domkirche nearby, these parades created another opportunity for the public review of Berlin's clocks. In this context, pocket watches provided an independent platform, and their very public use, ultimately, changed how time was constructed.

The pocket watch provides another opportunity to consider whom Berlin's temporal public included and excluded. First, we must consider gender. Pocket watches were a male fashion accessory and were worn with trousers, which only appeared at the end of the eighteenth century. Women wore other kinds of watches, such as necklace watches and small watches that were pinned directly to the clothing.³⁷ Neither type of watch could be set as easily as a pocket watch, though the eighteenth-century pocket watch was more unwieldy than modern ones.³⁸ This put men in a different public position vis-à-vis public clocks from that of women. With a pocket watch in hand, a man could directly confront a public clock and consume time publicly, being then able to bring the correct time home to a pendules. In this respect, time occupies a unique position. It contributed to the distinction between public and private, even as it reached across it.

Second, we must consider class. Heinrich Heine's description of the "beautiful people" promenading refines the picture further. Berlin's workers may have owned pocket watches, but it is doubtful that they took afternoon promenades. The promenade was public display of one's social position and its timing was particularly important for public time, since noon was when

36. Karl Friedrich von Klöden, *Karl Friedrich von Klödens Jugenderinnerungen* (Leipzig, 1911), 40.

37. On the history of watches, see Landes, *Revolution in Time*, 98-113, and 270-271. See also Helmut Kahlert, "400 Jahre Taschenuhren Dargestellet an Exponaten de deutchen Uhrenmuseums Furtwangen," *Die Weltkunst* 65, no. 2 (1995): 130-133.

38. Unlike today's watches, early pocketwatches came with a separate key that had to be inserted into the side of the watch to set it.

public clocks were set. Hence, the promenade coincided with the moment when clocks were thought to be most accurate. Public time setting was a very particular social ritual; only those with the leisure to stroll and the pants and pocket watches to wear would have been part of this new time-consuming public. The evidence is admittedly slim, but it does point to the temporal public becoming more masculine and more elite during the eighteenth century.

III.- The State, Science, and Public Management.

After 1750, new institutions arose to compete for control over public time. The two most important were the police department and the Academy of Sciences. Founded in 1742 by Frederick II, Berlin's Police Directory (Polizeidirektorium) assumed control over all Berlin's public clocks.³⁹ This change set a familiar dynamic in motion: in becoming responsible for the city's clocks, the police became answerable to a public that used them. This meant that any discussions about time's management eventually made their way through the police.

Institutional science redefined time by linking it to natural knowledge. The Academy of Sciences had been connected to time reckoning from its foundation in 1701, because the original charter expressly granted it a monopoly on the production of calendars.⁴⁰ Calendars of all types, including the city directory of nobles—called the *Adressen Calender*—became a major source of revenue for the academy.⁴¹ By the middle of the eighteenth century, however, the Academy had also become famous for its work in mathematics and astronomy.⁴² I will have more to say about the Academy's

39. Hubert C. Johnson, *Frederick the Great and his Officials* (New Haven and London, 1975), 85. This was not a modern police force, with officers walking beats, as police (Polizei) had a broader meaning then than it does today, implying the need to keep order rather than to prevent crime.

40. The Academy's original charter granted it a monopoly on calendars as a source of income. See, Adolf von Harnack and Otto Köhnke, *Geschichte der Königlich preussischen akademie der wissenschaften zu Berlin* (Berlin,, 1900), 66-69.

41. *Königlich Preußischen Academie der Wissenschaften, Adres-Calender, der sämtlichen Königl. Preuß. Lande und Provinzien: ausser den Residenzien Berlin, dem Königreiche Preussen und dem souverainen Herzogthume Schlesien; der darinnen befindlichen hohen und niedern Collegien, Instanzen und Expeditionen, ingleichen der königl. Bediente, Magisträte, Universitäten, Prediger ... auf das Jahr ...* ([Berlin], 1748-1775). (Thanks to Mary Terrall for highlighting this point for me.)

42. For calendars, see *Neu zu jedermanns Gebrauch eingerichteter astronomischer, historischer und Schreib-Calender: aufs Jahr nach Jesu Christi Geburt ... ; worinnen der Planeten Aspecten, Auf- und Untergang, Erwehlungen, Gewitter, astrologische Prophezeiungen und andere Calender-Sachen befindlich; fürs Hertzogthum Schlesien und benachbarte Länder*, (Berlin, 1746); *Astronomischer Kinder-Freund: Enthaltend: Einen Unterricht vom Calender, dessen Ursprung und Gebrauch; ingleichen: von der Eintheilung der Zeit, vom Lauf der Sonne, des Mondes und Gestirns; nebst einer Beschreibung der Erde, beigefügten Regenten-Tafel, und moralischen Sprüchen auf jede Woche im Jahr*, (Berlin, 1784). For astronomical works, see Johann Elert Bode, *Anleitung zur Kenntniß des gestirnten Himmels auf jede einzelne Monate des Jahres eingerichtet* (Hamburg, 1768); Bode, *Kurzgefaßte Abhandlung von dem im Herbst dieses 1769sten Jahres erschienenen Kometen nebst einem geometrischen Entwurf seiner wahren Laufbahn um die Sonne* (Hamburg, 1769); Bode, *Monatliche Anleitung zur Kenntniß des Standes und*

science in the next section. For now we must recognize that both the police and the Academy of Sciences laid claim to different aspects of public time. The police oversaw clocks, because they contributed to public order. The Academy, however, introduced a new definition of time that initially brought disorder. These different claims were then mediated through Berlin's public sphere. Only when science and the state combined to control the public was there a single time in Berlin.

Science's bid for control over time began with the Academy clock's installation. Almost immediately Ewald von Hertzberg, the Academy's Curator, tried to make his clock Berlin's temporal authority, writing to the Domkirche's consistory on October 16, 1787, that he had the city's most accurate clock and hoped that Berlin's churches would follow it.⁴³ The consistory's president, Wolfgang Ferdinand Doernberg, responded that he had no objection, but since he could speak only for the Calvinists, Hertzberg would have to go to the police to get the other churches to acquiesce.⁴⁴

On November 3, 1787, the police responded to Hertzberg by calling for public time's reorganization.⁴⁵ Berlin was to switch to mean time, all clocks were to be set in accord with the Academy clock, and all sundials were to be removed from public clocks. In addition, the police also demanded that Carl Ludewig Buschberg the *Stadtuhrmacher* be given control over all public clocks, except for the Academy clock. Had all of this actually happened, Berlin would have become only the second city in Europe to rationalize its system of public time. (In 1780, Geneva became the first to establish a city-wide master clock; London was second in 1792; Berlin actually came in third in 1810; Paris was fourth in 1816.)⁴⁶ It did not turn out that way.

The police's intervention sparked a bureaucratic war. By that time, Carl Buschberg had finagled the maintenance contracts on the turret clocks in Berlin's four Calvinist churches, the Domkirche, the Parochialkirche, the Dreifaltigkeitskirche, and the Böhmisches Kirche. In spite of his success, Buschberg also wanted control of Berlin's three other major clocks, each located in the Grauen-Kloster-Kirche, the Georgenkirche, and the Friedrichswerdersche Kirche. He reported to the police, however, that these

der Bewegung der Planeten und des Mondes vom Monat May 1774 bis Monat December 1775 nebst Berechnung der mittlerweile vorfallenden Himmelsbegebenheiten (Berlin, 1774); Bode, *Beschreibung und Gebrauch einer auf den Horizont von Berlin entworfenen neuen Weltcharte in zween Hemisphären worauf die neuesten Entdeckungen angezeigt werden* (Berlin, 1783); Bode, *Anleitung zur allgemeinen Kenntniß der Erdkugel* (Berlin, 1803); Bode, *Anleitung zur Kenntniß des gestirnten Himmels* (Berlin, 1858). Bode is notable in this context, because he was the clever astronomer to whom Hertzberg referred in his speech. On astronomers and their increasing public authority, see Simon Schaffer, "Authorized Prophets: Comets and Astronomers after 1759" in John Yolton and Leslie Ellen Brown, eds., *Studies in Eighteenth-Century Culture*, vol. 17 (East Lansing, MI, 1987), 45-74.

43. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 13r.

44. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 14r.

45. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 17rv.

46. Dohrn-van Rossum, *History of the Hour*, 346.

churches preferred to keep their own clock setters. The recalcitrant institutions were Lutheran and were loathe to hire some Calvinist.⁴⁷

The picture became more complicated, when Hertzberg nominated his own man, Christian Moellinger, as the ideal person for setting all of Berlin's public clocks.⁴⁸ Two new power centers, the city government and the Academy of Sciences, now competed to seize public time from Berlin's religious authorities. The conflict ended in a truce. On November 14, 1787, after an exchange of letters, the Lutheran consistory announced that it would accept the Academy clock as a standard, but refused to relinquish the power to hire its clock setters.⁴⁹ Buschberg retained the churches that he already had, and Moellinger became the Academy's official clock setter, garnering a new title, l'Horloger de l'Academie.⁵⁰ In theory this compromise guaranteed Berliners accurate time through a rapid distribution of the Academy clock's time. Here the public presented a problem, however, as it repeatedly complained that the Academy clock was not running accurately.

In order to understand the public's dissatisfaction with the Academy clock, we must go back to the period before it was installed. Christian Moellinger first built the clock for scientific use as an equation clock, which was a time device that displayed "true time" and "mean time" together. Relatively rare, equation clocks were meant for a small market of scientists and collectors. They were extremely accurate and, thus, ran on mean time, generally showing true time as a deviation from the mean. Moellinger's equation clock, for example, lost only seconds during the course of an entire year. This situation offered astronomers an exact index for making their observations, but was no good in a public environment of variable hours.

Although no drawings of Moellinger's original clock remain, Johann Esias Silberschlag, a member of the Academy of Sciences, published a review of the clock in the June, 1786 issue of the *Berlinische Monatsschrift*.⁵¹ Silberschlag noted that the clock was very complicated; it included a full calendar and extensive chimes that rang out the day's different times. He reviewed the entire clock positively, admiring its beauty and elegant design, but he saw accuracy as its most important feature. According to Silberschlag, Moellinger's clock kept time down to the minute and its accompanying calendar was so advanced that it accounted for leap years for the next 3200 years. He even accorded the clock's regularity the highest praise, saying that it was accurate enough for taking astronomical observations. It is doubtful, of

47. Religious parochialism dominated the various consistories until well into the nineteenth century. See the papers in Brandenburg LHA, Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller.

48. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 22rv.

49. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 27r.

50. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 33r.

51. Johann Esias Silberschlag, "Nachricht von einer neuen kunstreichen astronomischen Uhr in Berlin," *Berlinische Monatsschrift* 7 (1786): 555-559.

course, that a large segment of Berlin's population was making critical astronomical observations of its own. Nonetheless, Silberschlag's express connection of accuracy and astronomy calls our attention to conceptual changes that were already underway before the clock was installed in the Academy. Astronomy had become a key factor in changing the way all Berliners thought about clocks, and through it the Academy clock entered the public mind.

After Silberschlag's review appeared, Moellinger offered to sell his clock to the Academy of Sciences.⁵² The Academy refused, probably because it had already acquired one in 1769.⁵³ Undaunted, Moellinger changed tactics, and on May 22, 1787, he submitted a revised proposal to Ewald von Hertzberg that called for installing his astronomical clock above the window of the Academy's main entrance. As Moellinger put it:

a clock should be installed in the large, middle window above the great door, so that the public will have a clock, according to which all public and private clocks can be set reliably.⁵⁴

He attached a drawing of the proposed clock and the changes were dramatic. Gone was the clock that accounted for three millennia of leap years, replaced by a simple faceplate that had only one purpose—to present the Academy's time to Berlin's public.⁵⁵

Hertzberg accepted Moellinger's offer. But now Moellinger had to rebuild his astronomical clock to fit into the Academy's edifice, and in short order. Moreover, the change in intended audience required a change in how the clock represented Berlin's two times. As Moellinger wrote to Hertzberg:

When I received the order three months ago to complete an astronomical clock, such a [short] time frame could only have inspired me. Therefore, I have used my abilities in a small way to make [the clock] show true and mean time simultaneously...⁵⁶

Whereas the original version had shown "true time" as the difference between "mean" and "true time," the new version had four arms, with one pair showing "mean time" and the other "true time."

The redesigned face was a public disaster, since nobody could figure out which arms to follow. In response, the government announced in the November 17, 1787 issue of the Königlich-privilegierte Berlinische Zeitung von Staats- und gelehrten Sachen:

As experience has taught that the double time display of the clock recently installed in the Academy along Unter den Linden

52. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 4rv.

53. Chapuis, *Le Grand Frédéric et ses Horlogers*, 35-36.

54. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 10v.

55. See the unpaginated drawing in BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten.

56. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 12r.

has caused the better part of the public much trouble in setting their clocks...two of the clock's arms will be removed from the outer faceplate that was intended for the public. Only the minute and hour arms that show true time set by the sun will remain.... In order that this expected change, which the promotion of public order requires, does not affect the work of Herr Moellinger, the four arms on the inner faceplate that faces into the Academy's round foyer will, as before, simultaneously show both true and mean time, that is complete time, so that experts can view both in the foyer.⁵⁷

People outside the Academy's walls relied on true time. Those inside the Academy enjoyed two different kinds of time. Put another way, scientific practices remained within the Academy's walls, even as scientific values permeated them.

The Academy clock highlights what was, in fact, a conflict of precisions. The problem lay in the public's expectations: Berlin's most accurate clock always ran inaccurately from the Berliner's perspective. Let us return to the problem of "mean" versus "true time," considering it both on the theoretical and practical levels. First, as I have already noted, under true time the hour's duration waxed and waned throughout the year. There are only four days during the year when the mean time hour is equivalent to the true time hour, and no mechanical device can make up for the changes. This made the Academy clock's reputation for accuracy a problem, in that people expected it to cleave to true time, when it could only do so a few times per year. Since the length of the hour constantly changed, the Academy clock appeared perpetually "wrong" to the public, which promptly let this fact be known.

We can understand this disconnect more clearly by considering how public clocks were maintained. As I noted, the Domkirche's clock was supposed to be set daily by the sun. This was due not to the variations in "true time" hours, but to the mechanism's irregularity. Were the clock not set once a day, it would have been useless. The Academy clock, in contrast, was so regular, losing only seconds per year, that from the specialist's perspective it made no sense to set it more than once per week. The Academy's maintenance contract with Christian Moellinger seems to have recognized this, as he was obligated to set the clock only on Mondays.⁵⁸ The practical outcome was that the Academy clock became less "accurate" as the week went on, since difference's in the hour's duration added up. Unfortunately for the Academy, the people on the street noticed the growing difference, since they were expecting greater accuracy.

The ensuing limitations in the Academy clock's performance inevitably inspired commentary. In 1793, the Academy yielded to the public pressure by

57. "Anzeige," Königlich-privilegirte Berlinische Zeitung von Staats und gelehrten Sachen, November 17, 1787.

58. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 33r.

installing a sundial directly onto the Academy clock's face. (See figure 3.) Now a time device used since ancient times would judge Berlin's most accurate clock, the scientifically managed center of Berlin's temporal infrastructure. These tensions suggest a new way of approaching the problem of accuracy. The Academy clock and its sundial were both "scientific." Each was based on visual observation and was associated with Berlin's scientific establishment. The real issue was who would have to yield in the competition to determine this kind of knowledge.

Ironically, the sundial made the situation worse and the public complaints persisted.⁵⁹ In response, Moellinger submitted a report to the Academy dated November 5, 1801, in which he argued that the problem was not the clock itself, but new circumstances.⁶⁰ First, he decried the sundial, which he argued caused the public to recognize immediately the smallest difference between "true time" and the clock's time. Second, he complained that the constant stream of visitors to the clock kicked up so much dust that its gears became fouled. These points highlight two important issues. First, the Academy clock had become public property, as witnessed by the constant stream of visitors to the Academy's front door. Second, the public came to the clock because, in its view, correct time ought to have been there. The rituals of public time gathering gave new meaning to Berlin's clocks and to the spaces in which they were located.

Berlin's temporal uncertainty reflects the problems in time's new public status. On May 1, 1804, in response to more public complaints, Moellinger submitted to the city government a plan for overhauling Berlin's entire infrastructure of clocks. In view of all the recent problems, Moellinger argued that Berlin needed a clock tower that would be visible to many more people than the Academy clock was. As a sign of how much the politics of time had changed, Berlin's magistrates forwarded the plan to the Academy of Sciences for evaluation. Science would now have a say in what time was. On May 6, 1804, the members of the Mathematical Division of the Royal Academy of Sciences released a report that agreed with Moellinger's general point, but disagreed as to the cause.⁶¹ In their view, Berlin's time was inconsistent not because the technical aspects of its delivery needed to be improved, but because the public's theory of time was inadequate. They held:

This purpose can only be completely achieved if we no longer require of our clocks that they mark longer hours on one day of the year than they do on another, because they must otherwise

59. October 23, 1801, the Academy informed Moellinger of the public complaints, writing:

We have noted unhappily that the clock installed in the round foyer of the Academy has been running inaccurately for quite some time, which has given cause to many critical judgments in the public.

(BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 40r).

60. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 44rv.

61. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 49-52rv.

function irregularly in order to run accurately without constant supervision.⁶²

The Academy suggested a few ways to overcome this problem. First, all clocks should be set according to mean time. Second, the city should install a master clock (Normaluhr) in the center of the city “at a great height.”⁶³ They noted, in passing, that the Academy clock could not fulfill this role, since it had no chimes and was too low to the ground. Third, they called for a time signal, so that those areas that could not see the new master clock would still be able to set their clocks to the correct time. Among other things, they suggested that a flag be raised at noon or perhaps a cannon be fired.

The project was never undertaken because the King deemed it too costly and poor Moellinger’s problems persisted. On February 3, 1809, the Academy sent Moellinger a now familiar letter of complaint:

The public clock in the window above Academy’s round foyer has been running so inaccurately for the last few days that the public has expressed its dissatisfaction.⁶⁴

By 1810, the public’s complaints became too much for the city government and it passed a law that made the Academy clock Berlin’s master clock. From this point forward there would be only one time in Berlin, and it would be the mean time calculated by the Academy’s scientists.

IV.- The Public Face of Science.

Moellinger’s complaint about the constant stream of visitors to the Academy clock’s face is one of the more telling examples of science’s public victory in the late eighteenth century. Consider what these public visitations meant. By any traditional measure the Academy clock was an unlikely public clock. It was low to the ground, had no chimes, and could not be seen from an angle. (See figure 4.) This meant that people had to go directly to the Academy’s front door, stand before the clock, and look up. That they did so repeatedly, and so very publicly, suggests that time and science had become inextricably linked in the public mind, in spite of the problems with the clock’s accuracy. All of this suggests how complicated and contingent public time rituals were. For all of these things to happen as they did in Berlin, the city needed a scientific clock, and Berlin’s men needed trousers and pocket watches.

We begin with the Academy of Sciences. The Academy occupied two important positions in Berlin. Beginning in 1701, it became the center of scientific work in the city. Within its walls experiments were done, papers were read, discoveries made. Although most people had little understanding of what was happening inside (witness the flap over the clock’s four external

62. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 50r.

63. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 51v.

64. BBAW Akademiearchiv, Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten, 66v.

arms), during the eighteenth century, the Academy continued to grow in prestige, in particular for its mathematical and astronomical discoveries.⁶⁵ Second, the Academy of Sciences' building became integral to the growing city's landscape. Located across from the Royal Library and the Opera, next to the Prinz Heinrich Palais, and just up the street from the Zeughaus, it was part of the nucleus of a new social space, the promenade Unter den Linden, which extended from the Stadtschloss to the Brandenburg Gate.⁶⁶ This street signaled the growth of a new part of the city, shifting the geographic and cultural center away from the Spree Island. In this context, the Academy of Sciences was both a cultural and architectural landmark, and its clock unified these characteristics in new forms of public behavior.

Now we must consider how the public associated the Academy with accurate time. First, the Academy's observatory was the most obvious element of the building. If nothing else, people could divine that the Academy's scientists were taking astronomical observations from the tower, even if the scientists themselves complained about the lack of equipment.⁶⁷ Second, like other places in Germany, Berlin witnessed the proliferation of astronomical calendars. Usually published by Academies of Science or Professors of Astronomy, these calendars allowed Germans to determine both "true" and "mean time" through careful solar observation.⁶⁸ Usually a person used a sundial, or a sextant that had either come with the calendar, or was built to its specifications.⁶⁹ Based on the geographic and astronomical information the calendar contained, the observer would read the sun's position, compare it to his charts, and then calculate the time he wanted.

Using a calendar required devotion to accurate observation supported by science. (Astronomical calendars were accepted precisely because recognized astronomers had made them). Moreover, getting the time was based on general knowledge of where one stood on the globe.⁷⁰ Astronomical calendars expressly connected time sense with a sense of place, and created, thereby, a public that was intimately connected with the time of its location. Figure 5

65. Harnack and Köhnke, *Geschichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin*, 431-444.

66. For contemporary description of Unter den Linden and its famous buildings, see Friedrich Nicolai, *Beschreibung der königlichen Residenzstädte Berlin und Potsdam* (Berlin, 1980).

67. I am grateful to Prof. Mary Terrall of UCLA for pointing out the observatory's contemporary problems to me.

68. See, for example, *Vollständiger astronomischer Calender: nach dem verbesserten Stylo; auf das Jahr nach Christi Geburt ... ; auf den berlinischen Meridianum berechnet und herausgegeben unter Genehmigung der von Seiner Königlichen Majestät in Preussen in dero Residentz Berlin gestifteten Academie der Wissenschaften*, (Berlin, 1747-1756); *Astronomischer Kalender, nach dem verbesserten Stylo auf das Jahr 1732: Auf den berlinischen Meridianum gerichtet ...* (Berlin, [1731]).

69. See, Christoph Friedrich Müller, *Friedrich Christoph Müllers, Mitglied der K. Pr. Ak. d. W., Tafeln der Sonnenhöhe für ganz Deutschland, und dessen westlich und östlich benachbarte Länder; nebst einem in Kupfer gestochenen Sextanten* (Leipzig, 1791).

70. Consider Johann Elert Bode, the Berlin Academy of Sciences' chief astronomer. He became famous through a series of works on astronomy, among which were works such as these: Bode, *Beschreibung und Gebrauch einer auf den Horizont von Berlin entworfenen neuen Weltkarte in zween Hemisphären worauf die neuesten Entdeckungen angezeigt werden*; Bode, *Anleitung zur allgemeinen Kenntniß der Erdkugel*.

shows one way that contemporaries envisioned the connection between science, time, and place. The image is from the frontispiece of an encyclopedia on clock making that was published in ten volumes out of Halle, beginning in 1793.⁷¹ First, on the bottom right hand side of the picture is a globe, a representation of the specific knowledge that eighteenth-century science was producing about the natural world. Second, on the table, next to the woman in the toga (ratio?), is the clock she will set in accord with her observations. Third, in front of the clock is an astronomical calendar that provides the necessary information for making the calculations. Fourth, the woman holds in her hands the sextant with which she will take her reading.

This picture encapsulates the public attitude that greeted the Academy clock. Close solar observation with the support of public science created a “scientific” approach to time. Moreover, this approach was connected to life in Berlin, as part of its emerging promenade on Unter den Linden. Thus, the world of science became expressly connected with the soil on which Berliners stood. This justified “true time” even though people could have had the more scientific “mean time.” Combined with its location on Unter den Linden, the Academy of Sciences became the logical place for Berlin’s public to get the correct time and to be seen getting it. This process of public time gathering contested the Academy’s authority, however, until the public lost the ability to make challenges. It was only after the state took away the means for pursuing this other form of scientific knowledge that Berlin finally had one time and one authority to rule over it.

71. J. G. Geißler, *Der Uhrmacher oder Lehrbegriff der Uhrmacherkunst*, 10 vols. (Leipzig, 1793).

Conclusions

In the mid-19th century, the then-popular German writer Karl Gutzkow looked back on his youth in Berlin. As a child, he had grown up in an apartment in the Academy of Sciences, and among his recollections were these of the Academy Clock:

Whoever walks by and is a man of the clock stops here for a while. The pocket watch's chain is pulled, and the wise man thoughtfully sets it according to the large clock that hangs in the main entrance above a pendulum moving solemnly.... The point Archimedes sought from which to move the earth lies for the Berliner between the Academy clock here and Petitpierre's Barometer over there. "Give me a place to stand!" preach the devout...[preachers] in St. Matthews Church and the Church of the Holy Trinity. Müller and Schulze have only one firm belief: that in the clock at the Berlin Academy.⁷²

Gutzkow's memories reflect the changes that the Academy clock had effected. By the mid-19th century, science had penetrated the Berliner's public mind, and as Gutzkow notes, devotion to accurate time had become a publicly enacted ritual of devotion to the new worldview.

Gutzkow's mention of public enactment highlights how the Academy of Sciences shaped modern time sense to Berlin. Originally located in church steeples, time's locus moved to the clock in the Academy of Sciences, where it basked in its host's institutional prestige. Responding to and responsible for this prestige, Berliners changed the social and institutional relationships surrounding public time by putting trust in astronomers rather than consistories and clock setters, in sight rather than sound. This transition was far from smooth, but in the end the Academy clock became a public good in need of constant oversight by scientists, the state, and the people.

By the beginning of the nineteenth century time had become a form of public scientific knowledge. The conceptual changes that made this possible are rooted in two eighteenth-century developments. The first is the spread of the eighteenth century public sphere. As the public coalesced, it felt empowered to complain that Berlin's public clocks were not meeting its standards. Second, time took a scientific form. The rise of science within the public sphere brought scientific practice into daily life and made temporal accuracy a public value.

This final element appeared at the start of the nineteenth-century with the state's willingness to rationalize time. Until the state acted, Berlin had competing definitions of time and, hence, of accuracy. No moment highlights

72. Karl Gutzkow, *Aus der Knabenzeit* (Frankfurt am Main, 1852), 5-6. Also reprinted in Karl Gutzkow, *Unter dem schwarzen Bären. Erlebtes 1811-1848* (Berlin, 1971), 26.

this more clearly than the final removal of the Academy of Sciences' sundial. Although Berlin rationalized its time in 1810, the sundial persisted, giving people yet another opportunity to critique the Academy's time. The public's solar-based time lived on until 1811, when the sundial was quietly removed.⁷³

Only after the state established one, scientific definition could the Academy clock finally become Karl Gutzkow's Archimedean point. Once the state determined what knowledge was, the debate about clocks ended and the subjection of people to those clocks became possible. For a brief period before this intervention, however, Berliners developed their own time sense through an alternate vision of science, and they used this vision to discipline the Academy clock. That this vision lost out in the end is important, but not because it represents the progress of time disciplining. Much more important is that it highlights how clocks and the complexities of city life could produce and, ultimately, destroy competing forms of knowledge about the world.

73. The Krünitz Encyclopedia (1832) wrote of the sundial:

“Im Jahre 1793 hat der Professor Bode in Berlin unter den Linden, am Akademiegebäude, mit Genehmigung des Königl. Ministeriums und der Akademie, gerade unter der daselbst befindlichen Penduluhr, eine Sonnenuhr aufrichten lassen, damit die Bewohner der Hauptstadt bei scheinender Sonne, die wahre Sonnenzeit auf der selben sowohl, als an jeder Penduluhr, die hierauf eingerichtet ist, mit einem Blicke bemerken können. ... Diese Sonnenuhr ist seit ein Paar Jahren abgenommen worden. Die Ursache is nicht bekannt.”

Johann Georg Krünitz, *Oekonomisch-Technologische Encyklopädie*, vol. 155 (Berlin, 1832), 706.

Appendix



Figure 1: Unter den Linden with Academy of Sciences (ca. 1787). BBAW Akademiearchiv, Akademie-Gebäude (Mitte 18. Jahrhundert-1903).



Figure 2: The Second *Domkirche* with Public Clock (ca. 1750). *Postkartensammlung*, Zentrum für Berlin-Studien, Haus Berliner Stadtbibliothek Breite Str. 30-36, D-10178 Berlin.

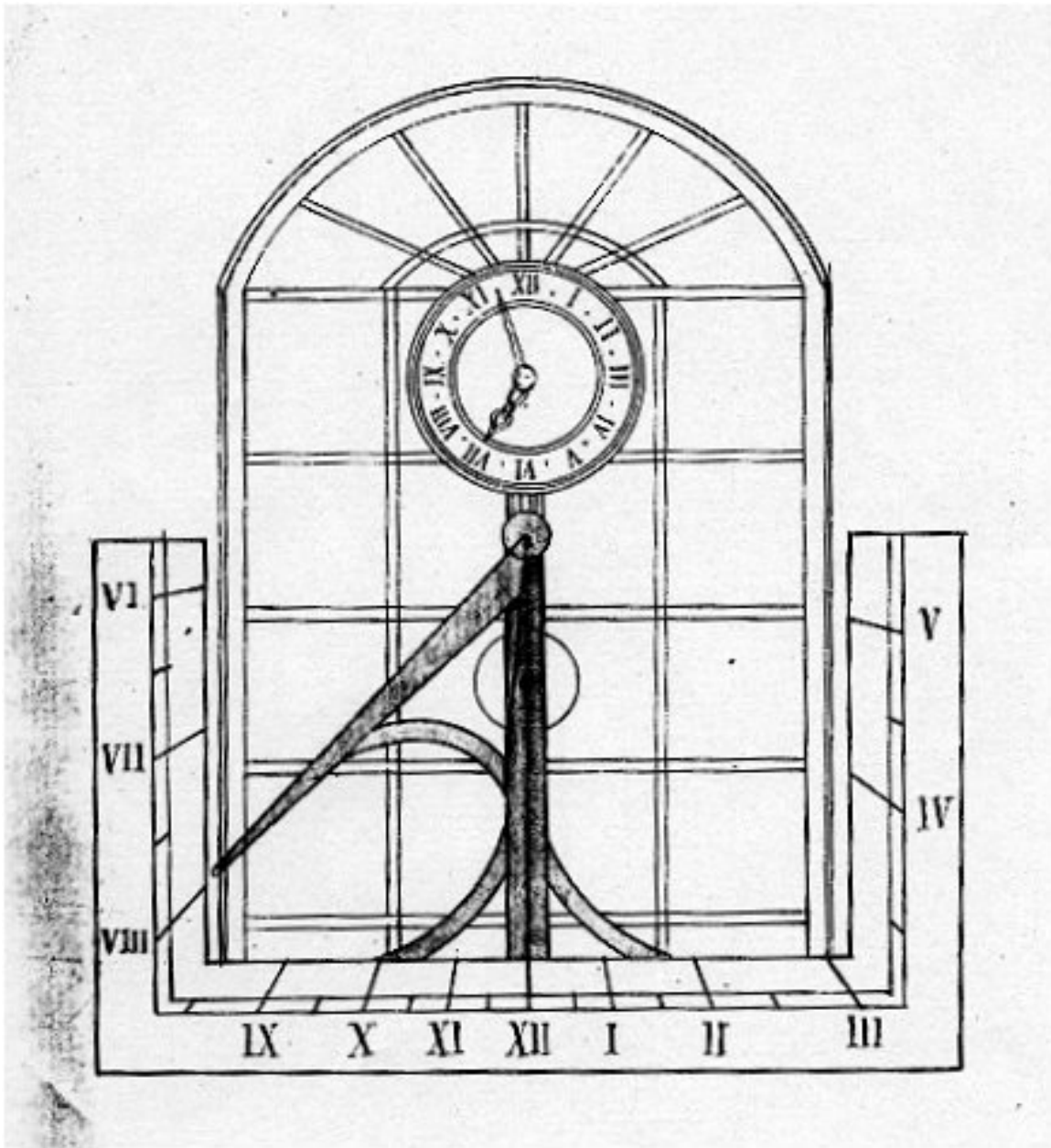


Figure 3: The Academy Clock with Sundial (ca. 1793). BBAW Akademiearchiv, Best. I, Abt. III, Nr 105 A, Personalien der Mitglieder und Officianten.



Figure 4: Royal Academy of Sciences Main Entrance with Academy Clock (ca. 1903). BBAW Akademiearchiv, Akademie-Gebäude (Mitte 18. Jahrhundert-1903).



FIGURE 5: FRONTISPIECE TO J. G. GEIBLER, *DER UHRMACHER ODER LEHRBEGRIFF DER UHRMACHERKUNST* (LEIPZIG: CRUSIUS, 1793).

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