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MICHAEL J. SAUTER

**Clock Watchers and Stargazers: On Time Discipline
in Early-Modern Berlin**

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Tel. 5727•9800 exts. 6090 y 6092
Fax: 5727•9885 y 5292•1304.
Correo electrónico: publicaciones@cide.edu
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Abstract

This essay contests the view that humanity's centuries-long experience with clocks is marked by a steady increase in time awareness that culminated in the modern compulsion known as "time discipline". It argues, in contrast, that modern time discipline emerged during the eighteenth century, and as a result of a change in discipline's direction. Using early-modern Berlin as a case study, this article holds that before 1800 time discipline was directed by people at clocks. After 1800, however, the process reversed itself. This essay attributes the reversal to three eighteenth-century phenomena: 1) the advance of clock making techniques; 2) the appearance of print and urban public spheres; and 3) early-modern science's successful claim to control over natural knowledge. This combination fixed time as knowledge, which facilitated its spread throughout Europe, and, later, the world.

Resumen

Este ensayo refuta la visión de que, a lo largo de los siglos, la relación de la humanidad con los relojes ha estado marcada por un incremento constante de la conciencia del tiempo, que ha culminado con la moderna compulsión a la "disciplina del tiempo". En cambio, el presente artículo defiende que la disciplina del tiempo emergió durante el siglo XVIII como resultado de un cambio en la dirección de la disciplina. A través del estudio de caso durante la modernidad temprana de Berlín, se sostiene que antes de 1800 la disciplina del tiempo subordinaba los relojes a la gente. Pero después de 1800, el proceso se revirtió. Este ensayo lo atribuye a tres sucesos del siglo XVIII: 1) el avance de las técnicas para hacer relojes; 2) la aparición de la imprenta y de las esferas públicas; y 3) el éxito que, en el inicio de la modernidad, tuvo la exigencia de las ciencias para controlar el conocimiento sobre la naturaleza. Esta combinación estableció al tiempo como conocimiento, lo cual facilitó su expansión en toda Europa y, más tarde, en el mundo.

Introduction

No two things in this world have the same measure of time...
Formulating it boldly, there are in the universe at one time an
infinite number of times.

Johann G. Herder, *Metacritique of the Critique of Pure Reason* (1799)¹

Herder's critique of Kant's temporal aesthetic, which I have cited above, mirrors the current debate on the history of time sense. Whereas Kant articulated a single philosophical manifold that made time's apprehension possible, Herder emphasized the multiplicity and cultural embeddedness of temporal experience.² A similar divergence has occurred in historical work on time sense's evolution. The field has long been concerned with the rise of time discipline, the broad and uniform process by which westerners shifted from using clocks to being dominated by them. Over the last ten years, however, scholars have noted not only the variety of time disciplines in Europe and North America, but also the manifold origins of this behavior. As a result, the history of time discipline as a unified tale has begun to dissolve.

The traditional narrative runs as follows. From the Middle Ages until the present day, awareness of time has constantly increased in the Western world.³ This process began in medieval cities with conceptual and technical changes. First, merchants shattered Christianity's universal time sense by carving it into small secular times within which one could make money.⁴ Second, monks taught people to organize their lives in accord with a schedule.⁵ Third, the spread of urban public clocks in the fourteenth and fifteenth centuries made clock time a daily experience, a trend augmented by emerging market forces that connected clocks with economic productivity.⁶

¹ Johann Gottfried Herder, *Sämmtliche Werke*, ed. Bernhard Suphan, vol. 21 (Hildesheim, 1967), 59. Unless otherwise noted, all translations are my own.

² On Kant's understanding of time and space, see his discussion of the transcendental aesthetic in Immanuel Kant, *Critique of Pure Reason*, Norman Kemp Smith (trans.), New York, 1965, 65-91.

³ Carlo M. Cipolla, *Clocks and Culture 1300-1700* (London, 1967); David S. Landes, *Revolution in Time: Clocks and the Making of the Modern World* (Cambridge, 1983). Gerhard Dohrn-van Rossum has provided a useful corrective to the existing literature in Gerhard Dohrn-van Rossum, *History of the Hour: Clocks and Modern Temporal Orders* (Chicago, 1996).

⁴ Jacques Le Goff, *Time, Work & Culture in the Middle Ages* (Chicago, 1980), 29-52.

⁵ On monasticism and time discipline, see Barnabas Hughes, "Friars, Hourglasses and Clocks", *Collectanea Franciscana* 53 (1984): 265-278. See, however, Gerhard Dohrn-van Rossum's critical comments in Dohrn-van Rossum, *op. cit.*, 30-43.

⁶ In general, see Otto Mayr, *Authority, Liberty Automatic Machinery in Early Modern Europe* (Baltimore, 1986), 3-27. For Germany, see Igor A. Jenzen and Reinhard Glasemann, *Uhrzeiten: die Geschichte der Uhr und ihres Gebrauches* (Frankfurt am Main, 1989). On work and urban time, see Dohrn-van Rossum, *op. cit.*, 232-236; Landes, *op. cit.*, 72-74.

Finally, during the late eighteenth and early nineteenth centuries people internalized this clock-based time awareness.⁷ No longer simply aware of time's passage, people now feel *compelled* to obey the clock. Many scholars hold that capitalism is responsible for this final development, because the industrial factory system imposed time discipline on a supposedly unwilling work force.⁸ From there, time discipline invaded the countryside, before taking on the world.⁹

The traditional narrative has, however, been hampered by its overriding concern with discovering *our* time discipline's origins. Framing the question so broadly generates a major project, given the extent of both the period (over 700 years) and the geographical area (western, central and southern Europe). Scholars have, thus, responded with sweeping explanations, and the result has been an over-determined narrative that not only characterizes diversity in time regimes as a problem to be overcome, but also attributes change to a single, if diffuse, cause. For example, the dominant strain in the literature is fundamentally a Marxist inheritance, and it ascribes increases in time discipline exclusively to changes in the structure of production, with the capitalist industrial system as the final determinant in modern time sense.¹⁰ Jacques Le Goff put the change in medieval time sense at merchants' feet; E. P. Thompson blamed capitalism and the factory system; others have looked to the railroads, or modern shipping.¹¹

Nonetheless, time discipline cannot be ascribed to the catch-all of capitalism, however important it was. As Gerhard Dohrn-van Rossum has noted, medieval time regimes were multivalent and malleable before merchants entered the scene, a product of multiple factors, including liturgical requirements, city bells and monastic practices.¹² From a modern perspective, as Paul Glennie and Nigel Thrift have argued, time discipline did

⁷ David Landes has called this "the shift from time obedience to time discipline", and he sees it as fundamental to the modern world. Landes, *op. cit.*, 2.

⁸ E. P. Thompson made the classic version of this argument in E. P. Thompson, "Time, Work-Discipline and Industrial Capitalism", *Past & Present* 38 (1967), 56-97. See the useful critical comments in Paul Glennie and Nigel Thrift, "Reworking E. P. Thompson's 'Time, Work-Discipline and Industrial Capitalism'", *Time & Society* 5 (1996), 275-299; Ulla Merle, "Tempo! Tempo! - Die Industrialisierung der Zeit im 19. Jahrhundert", in *Uhrzeiten: die Geschichte der Uhr und ihres Gebrauches*, ed. Igor A. Jenzen and Reinhard Glasemann (Frankfurt am Main, 1989), 161-217.

⁹ On this issue, Derek Howse's work on Greenwich Mean Time is essential reading. Derek Howse, *Greenwich Time and the Discovery of the Longitude* (Oxford, 1980).

¹⁰ Hoyt Alverson, "From 'Storyed Time' to 'Clock Time' in Economic Globalization at the New Millennium", in *Time: Perspectives at the Millennium (The Study of Time X)*, ed. Marlene P. Soulsby and J. T. Fraser (Westport, CT, 2001), 177-188.

¹¹ Le Goff, *op. cit.*; Thompson, *op. cit.*; Carlene Stephens, "'The Most Reliable Time': William Bond, the New England Railroads, and Time Awareness in 19th-Century America", *Technology and Culture* 30 (1989), 1-24; Howse, *op. cit.*

¹² Dohrn-van Rossum, *op. cit.*, 29-42.

not always follow capitalism but often predated it; and there is even reason to believe that it contributed to capitalism's development.¹³

We need to emphasize work much less and base our approach on local knowledge and temporal practices. As I will argue throughout, time regimes overall and time discipline in particular began as local knowledge, with people in specific places laying claim to their clocks and their time. Highlighting this alternate context suggests three general propositions that I will confirm through detailed analysis below. First, time discipline did not expand progressively into undisciplined territory but consisted of the integration of previously dispersed disciplines.¹⁴ As Carlo Cipolla has noted, public clocks dispersed across Europe via local envy: when one city or town installed a clock, its neighbors soon followed.¹⁵ Each place then developed a relationship to its clock(s), inscribing it (them) locally with meaning through constant surveillance and local discipline.¹⁶ Second, for centuries, and on a daily basis, people directed discipline at clocks, and not the other way around. Until the end of the early-modern period clocks were notoriously unreliable, which meant that users monitored them continually to ensure adherence to a public standard. Finally, and for reasons that I explore further below, time discipline changed direction at the end of the eighteenth century. Before about 1800, people disciplined clocks; after that time, clocks disciplined people.

With these things in mind, in the rest of this essay I use early-modern Berlin's experience with public clocks to explain why the nature of public surveillance changed.¹⁷ I connect this change to three eighteenth-century phenomena that figured prominently in Berlin: 1) the advance of clock making techniques; 2) the appearance of print and urban public spheres; and 3) early-modern science's claim to exclusive control over natural knowledge. The

¹³ Paul Glennie and Nigel Thrift have offered the finest rethinking of the traditional narrative. See Glennie and Thrift, "Reworking E. P. Thompson's...", *op.cit.*; Paul Glennie and Nigel Thrift, "The Spaces of Clock Times", in *The Social in Question: New Bearings in History and the Social Sciences*, ed. Patrick Joyce (London, 2002), 151-174. On time discipline as contributor to capitalism, see Thomas C. Smith, "Peasant Time and Factory Time in Japan", *Past and Present* (1986), 165-197; Mark Harrison, "The Ordering of the Urban Environment: Time, Work and the Occurrence of Crowds, 1790-1835", *Past and Present* (1986), 134-168.

¹⁴ On disciplining in general, see Michel Foucault, *Discipline and Punish: the Birth of the Prison* (New York, 1977); Norbert Elias, *The Civilizing Process*, Edmund Jephcott trans. (Oxford, 1994); Norbert Elias, *The Court Society*, Edmund Jephcott trans. (New York, 1983); Gerhard Oestreich, *Neostoicism and the Early Modern State*, ed. Brigitta Oestreich and H. G. Koenigsberger (Cambridge, 1982); Michel Foucault, *The Order of Things: an Archaeology of the Human Sciences* (London, 1970).

¹⁵ Carlo M. Cipolla, *Clocks and Culture, 1300-1700* (London, 1967).

¹⁶ For a modern example, see Eugen Thiele, *Das Glockenspiel der Parochialkirche zu Berlin* (Berlin, 1915).

¹⁷ Eviatar Zerubavel has made an argument that is similar in form, though he puts the change in time sense in the nineteenth century. Eviatar Zerubavel, "The Standardization of Time: A Sociohistorical Perspective", *American Journal of Sociology* 88 (1982), 1-23.

result was, I argue, a new foundation for time discipline. In Berlin, science, the public sphere and the State transformed time into knowledge, making it a standard to which others might adhere.¹⁸ Similar stories can be told for other European countries.¹⁹ David Landes' great book on clocks bears the title, *Revolution in Time: Clocks and the Making of the Modern World*.²⁰ The subtitle is most appropriate, for clocks did make the modern world, though only after the early-modern world created the time discipline that, ultimately, coursed through both.

¹⁸ On science as a joint cultural enterprise between specialists and non-specialists, see Thomas P. Saine, "Natural Science and the Ideology of Nature in the German Enlightenment", *Lessing Yearbook* 8 (1976), 61-88. On science and the public sphere, see Thomas Broman, "The Habermasian Public Sphere and 'Science in the Enlightenment'", *History of Science* 36 (1998), 123-149.

¹⁹ See, for example, Howse, *op. cit.*

²⁰ Landes, *op. cit.*

On August 23, 1787, Ewald von Hertzberg, curator of the Prussian Royal Academy of Sciences, gave a speech to the Academy. Celebrating the new king's supposed reformism, Hertzberg 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 be set by it.²¹

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 at the time.

A sign of science's growing prestige, the Academy Clock became fundamental to public life in the city. In 1822, Heinrich Heine (1797-1856) wrote:

It is 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.²²

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

The period between 1750 and 1822 reveals fundamental changes in Berlin's time regime. Before mid-century, most Berliners acquired the time aurally via turret clock bells and judged a clock's accuracy by whether the bells of different clocks rang synchronously.²³ Turret clocks rang out the time, theoretically in unison, though in actuality less so. Moreover, time's auralness was reinforced by design limitations. Turret clocks generally lacked minute arms, and for many years, the bells' peals on the hour, half-hour and quarter-hour were the most common way of both acquiring the time and judging the clocks that dispensed it.²⁴

The Academy Clock's installation crystallized, however, a new mode of acquisition. First, the Academy required time's visual apprehension, since it

²¹ 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), 19.

²² Heinrich Heine, *Historisch-kritische Gesamtausgabe der Werke*, ed. Manfred Windfuhr, vol. 6 (Hamburg, 1973), 14.

²³ On Berlin's churches and turret clocks, see Jürgen Boeckh, *Alt-Berliner Stadtkirchen* (Berlin, 1986); Gerhard König, *Uhren und Uhrmacherei in Berlin: Geschichte der Berliner Uhren und Uhrmacher, 1450-1900* (Berlin, 1988). On sound and time, albeit in a rural context, see Alain Corbin, *Village Bells: Sound and Meaning in the Nineteenth-Century French Countryside* (New York, 1998).

²⁴ Bernhard Schmidt, "Die Turmuhren", *Alte Uhren* 7 (1984), 47-56.

showed time down to the minute and, more importantly, lacked bells. In addition, its peculiar position, recessed in the building and low to the ground, left Berliners with no alternative but to walk directly to the clock and look up. Second, this clock was physically embedded in a state-supported scientific institution. This new position connected clock watching to the observational practices that science cultivated, albeit loosely. Hence, as time moved from an aural to a visual realm, it also left a religious context for a “scientific” one. Time’s new context affected public attitudes toward this clock: it was no longer enough for it to run well; it now had to be “accurate”. However, as we will see, the transition to scientific time was far from smooth, as the public had its own ideas about accuracy. In fact, the public’s understanding of accuracy impeded the coming of accurate public time.

The public interest in the Academy Clock immediately created problems, as the clock’s performance became the subject of repeated complaints. Originally, the outer face had two pairs of arms, one pair showing “true time” and the other “mean time”. Like most cities, Berlin ran on true time: the day started and ended with the sun, and clocks were set at local noon. From there, the day was divided into twelve equal hours. However, because the elapsed time between sunrise and sunset changed throughout the year, the hour’s length varied as well. The Academy Clock was, by contrast, built and advertised as an equation clock, a device that ran expressly on “mean time”, showing “true time” only as the difference between the two.²⁵ Mean time was calculated with equal units and was, therefore, not publicly accessible, since the units were determined by calculating the earth’s daily rotation with respect to a star.²⁶ As a result, the Academy Clock’s face harbored two incompatible approaches to time, which were based in differences between public and institutionally-based knowledge production. Until these two approaches to knowledge were united, some disorder was inevitable.

Thrust into eighteenth-century Berlin’s public life, the clock’s four arms and two times were a disaster. The public could not distinguish between the paired arms, and complaints mounted. The government responded by ordering that the “mean-time” arms be removed and announced in a local newspaper:

As experience has taught that the double time display of the clock recently installed in the Academy along Unter den Linden has caused the better part of the public much trouble in setting their clocks... the curator of the Academy, his Excellency, Count von Hertzberg, consulted with experts [*Sachverständigten*]... and concluded that two of the clock’s arms will be removed from the outer

²⁵ Johann Esias Silberschlag, “Nachricht von einer neuen kunstreichen astronomischen Uhr in Berlin”, *Berlinische Monatsschrift* 7 (1786), 555-559. On equation clocks, see Hans von Bertele, “The Development of Equation Clocks: A Phase in the History of Hand-Setting Procedure”, *La Suisse Horlogere* 74, 75 (1959, 1960), 39-46, 1-17; and Johannes Wenzel, “Equation Clocks”, *Antiquarian Horology* 13 (1981), 24-43.

²⁶ On “mean time” and “true time”, see Landes, *op. cit.*, p. 122.

faceplate that was intended for the public... 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.²⁷

Unfortunately for the Academy, these changes failed miserably, and public complaints persisted. The government, in turn, repeatedly reported the problems to the clock's maker, Christian Moellinger, noting expressly on one occasion that the clock's inaccuracy was making the public insecure (*verunsichert*).²⁸

The clock's travails open new vistas onto the relationship between clocks and the public sphere, as well as technology and society. The public's consternation stemmed from rising expectations that had been fueled by the appearance, especially after 1750, of relatively regular pocket watches.²⁹ In Berlin, which had its own watch industry, many people were able to keep pocket watches –some even carried two, though wags claimed that the second watch was often just a potato attached to a silver chain—. ³⁰ The pocket watch altered Berlin's time regime through its portability and exactness, features that made it a ubiquitous reference point. Second, also arising from changes in technology, the Academy Clock required less maintenance than older turret clocks. Whereas Berlin's other public clocks had to be wound and set daily, the Academy Clock needed only one setting per week. This new maintenance rhythm (a theme to which I will return) compounded discrepancies between the public's time and the Academy's time.

The Academy Clock would remain inappropriate as a public time keeper until two basic indexing problems were resolved. On the one hand, the Academy Clock counted uniform minutes, while the public, which used the sun as a standard, reckoned with elastic ones. On the other hand, the public used local noon as its daily starting point. This point had to be calculated daily, while the Academy's noon was independent of the sun. Hence, as the week progressed, the clock seemed further out of step to Berlin's clock

²⁷ Anon, "Anzeige", *Königlich-privilegierte Berlinische Zeitung von Staats und gelehrten Sachen*, November 17, 1787.

²⁸ The correspondence is contained in BBAW Akademiearchiv, "Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten", 44r-66v.

²⁹ Landes, *op. cit.*, 87-88.

³⁰ For Berlin's clock and watch-making industry, see König, *op. cit.*, 47-49; König, "Berliner Uhren", *Sammler Journal* 24 (1995), 1266-1270; Erika Herzfeld, *Preussische Manufakturen. Grossgewerbliche Fertigung von Porzellan, Seide, Gobelins, Uhren, Tapeten, Waffen, Papier u.a. im 17. und 18. Jahrhundert in und um Berlin* (Berlin, 1994), 219-224. On people, potatoes and pocket watches, see the contemporary reminiscences of Karl Friedrich von Klöden, in Karl Friedrich von Klöden, *Karl Friedrich von Klödens Jugenderinnerungen* (Leipzig, 1911), 40.

watchers, since they judged error with respect to the sun.³¹ For the purposes of this essay, this meant that all early-modern clocks were by definition *inaccurate*. Mechanical devices cannot mark the changes in the hour's duration, and this held true for all clocks, regardless of how true they ran. In fact, the problem became greater, as clocks gained a reputation for regularity. This point highlights a basic truth about all early-modern time regimes: irrespective of technical issues, all early-modern clocks—both public and private—needed constant care, in order to ensure that they kept the “correct” time. In short, clocks needed a system of discipline in order to serve the public.

The Academy's next public act highlights the Berlin public's growing relevance to the city's time regime. In 1793, under the leadership of its chief astronomer, Johann Elert Bode, the Academy installed a sundial on the clock's face (see fig. 2). Berlin's most modern and accurate clock would now be judged by a device with a most ancient pedigree. It may appear to have been a backward step, but it is actually best characterized as a progressive move.³² In general, sundials were crucial to early-modern time discipline, because they were used together with mechanical clocks. As a result, dialing became a sophisticated science. Manufacturers had to have a thorough understanding of geometry and the physical universe. Users acquired the time, as well as habits of mind such as observation and comparison that became important to the public time regime.

The eighteenth century became the sundial's greatest age, as it witnessed by the proliferation of public and pocket sundials across Europe. Most major cities had public sundials, and serious clock watchers also carried pocket sundials.³³ The Academy Sundial, for its part, derived significance from its direct association with scientific authority: the great Bode had designed it, and it was built *into* the Academy of Sciences. In this respect, the Academy Sundial accelerated changes in the Berlin's time regime. On the one hand, the sundial made time's visual aspects more important, since users needed to stand directly before the Academy and to look up in order to use it. On the other hand, the sundial invited public practice into a scientific realm by allowing the public a reference point that had been consecrated by the institution itself.

The resulting growth in public surveillance and clamor is apparent in the novel defense that Christian Moellinger, the clock's maker, made against the

³¹ On conceptions of accuracy in Germany, see Kathryn M. Olesko, "The Meaning of Precision: The Exact Sensibility in Early Nineteenth-Century Germany", in *The Values of Precision*, ed. M. Norton Wise (Princeton, N.J., 1999), 103-134.

³² Sara Schechner, "The Material Culture of Astronomy in Daily Life: Sundials, Science and Social Change", *Journal for the History of Astronomy* 32 (2001), 189-222. As a contemporary example, see H. E. Rumpel, *Betrachtungen über die Sonnenuhren nebst Verbesserung der creutzförmigen Uhr* (Erfurt, 1784).

³³ Schechner, *op. cit.*

continuing complaints. In 1801, in response to another complaint, he informed the Academy that the clock's inaccuracy resulted from the dust storm created by the constant stream of clock watchers to the Academy's front door (the dust supposedly fouled the clock's gears).³⁴ Moellinger's dust cloud represents beautifully the ambiguous results of the Academy Clock's interaction with a critical public. Time became the subject of public discussion, and one can readily image those people who made the effort to get the correct time commenting to each other what a mess the situation was. The government, whose authority was based in no small measure on its competence, was left with the responsibility to manage the clock properly.³⁵

In typical German fashion, the solution emerged after wide discussion within the government that included a written report from the Academy's scientists. The scientists, for their part, argued that the situation was the public's fault and recommended:

[that] 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 function irregularly in order to run accurately without constant supervision.³⁶

In 1810, the government accepted the opinion and anointed the Academy Clock as Berlin's master clock, also ordering that it be set to mean time. The switch to a public standard based on mean time was significant, because with it Berlin became only the third city in Europe to establish a master clock. Geneva was first in 1780, followed by London in 1792; Paris joined the club in 1816.³⁷

This trend is revealing, for it highlights fundamental changes in public knowledge across Europe. Much like other governments in Europe, Berlin's magistrates used state power to impose a scientific definition of time on the populace. Nonetheless, this measure failed over the short term, as the public still had access to the sundial. In 1811, the Academy had the sundial quietly removed.³⁸ Time was established as discrete knowledge only after the public was denied the tools for sustaining alternate forms.

³⁴ BBAW Akademiearchiv, "Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten", 44rv.

³⁵ On Prussian governance, see C. B. A. Behrens, *Society, Government and the Enlightenment: the Experiences of Eighteenth-Century France and Prussia* (London, 1985).

³⁶ Akademiearchiv, "Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten", 49r-52v.

³⁷ Dohrn-van Rossum, *op. cit.*

³⁸ Johann Georg Krünitz, *Oekonomisch-Technologische Encyclopädie*, vol. 155 (Berlin, 1832), 709. The documentary history of the clock's removal is available in BBAW Akademiearchiv, "Bestand I., Abth. II., Nr. 30 Acta die Aufstellung der akademischen Sonnenuhr betreffend, 1810-1811". See also Dohrn-van Rossum, *op. cit.*, 346.

The Academy Clock offers an important perspective on the history of time discipline. First, it highlights how time became a public issue in the early-modern period.³⁹ Clocks were not simply obeyed; they were observed, discussed and criticized. Second, time gathering was rooted in daily practices, whose physical, social and political aspects *located* the time gatherer in a specific place. In Berlin, the clock watching populace, probably always men, forsook other public clocks and went to the Academy Clock, where they looked up, pocket watch in hand. They did this in public view, and with the knowledge that others were also watching and evaluating them. Third, the clock also reveals science's ambiguous role in shaping Berliners' approach to time. To borrow a phrase from Norton Wise, the "values of precision" entered daily life in the late eighteenth century through public experience with time.⁴⁰ Nonetheless, the path to precision was tortuous, and the public tension suggests that deep changes in mental authority were underway. As we will see, Berlin's modern time regime became possible only after science developed new ways of producing knowledge about the world.

Heinrich Heine's comments on the Academy Clock appeared in 1822, well before industrial capitalism and the factory whistle arrived in the German states.⁴¹ This fact alone undermines the traditional emphasis on industrialization as time discipline's source, particularly as it appears in E.P. Thompson's "Time, Work-Discipline and Industrial Capitalism". First published in 1967, this article is the most famous example of the general narrative and remains fundamental to the field.⁴²

According to Thompson, capitalism's quantification of labor changed people's relationship to time. Whereas labor was task-oriented before 1700, with workers putting in hours sufficient only to complete a given task, by 1800 the factory system had disciplined workers to arrive at a certain time and to work for a specific duration, regardless of the task involved. This asymmetric and unwelcome work discipline then spread around the globe with railway networks, international shipping, and western colonialism, as temporal regularity embraced —one may even say strangled— the globe.⁴³ Supremely

³⁹ Anthony LaVopa's review article on the Public Sphere provides the best introduction to the literature. Anthony J. La Vopa, "Conceiving a Public: Ideas and Society in Eighteenth-Century Europe", *Journal of Modern History* 64 (1992), 98-115.

⁴⁰ M. Norton Wise, ed., *The Values of Precision* (Princeton, NJ, 1999), 3-16.

⁴¹ Hans-Ulrich Wehler puts *Industriekapitalismus* securely in the second third of the nineteenth century. Hans Ulrich Wehler, *Deutsche Gesellschaftsgeschichte*, vol. 1 (München, 1987), 14.

⁴² Thompson, "Time...", *op. cit.* For a work in the Thompson tradition, see Alverson, *op. cit.*; Paul Glennie and Nigel Thrift have been Thompson's strongest critics and their work is invaluable. See Glennie and Thrift, "Reworking E. P. Thompson's...", *op. cit.*; Glennie and Thrift, "The Spaces...", *op. cit.*

⁴³ On Greenwich Mean Time's spread, see Howse, *op. cit.* On the role railroads played in spreading a single time, see Stephens, "'The Most Reliable Time'...", *op. cit.*; Wolfgang Schivelbusch, *The Railway Journey: the Industrialization of Time and Space in the 19th century* (Berkeley, Calif., 1986); Geoffrey C.

disciplined westerners then finished the job by imposing their time discipline on a series of unwilling non-western peoples.⁴⁴

Sociologists and anthropologists have countered Thompson's approach, arguing that it elides the variety in temporal experience.⁴⁵ Hence, concentrating on the diffusion of factory time is not only gendered but also Eurocentric, because it ignores women's time and non-European, pre-industrial people's time. Although the critics have enriched our understanding of temporal experience, they have not undermined Thompson's fundamental insight that modern life is suffused by clock-based time, even if some people continue to ignore it.⁴⁶ Much like Herder's response to Kant, anthropological and sociological criticism has complicated the picture without overcoming the basic approach. However, legitimate Algerian peasant time may be, modern Algeria's clocks ran (and run) on the European standard. Arguing that the study of western time discipline leaves out "others" does not obscure that system's expansion.⁴⁷ Thus, rather than pursue time discipline through what amounts to a false anti-Euro-centrism, I reframe the issue by considering time sense through discipline. This approach may allow us better to understand both how various disciplines were incorporated into a single time standard, as well as how some managed resisted it.

A few historians have attacked the Thompson model, while pointing to other ways of understanding time discipline's historical development. Martin Bruegel has noted that time consciousness spread through the colonial-era Hudson Valley before industrialization.⁴⁸ Mark Smith has detailed how time discipline was imposed on slaves in the fields –well away from factories– in the ante-bellum south.⁴⁹ Philip Morgan has highlighted a unique practice in ante-bellum South Carolina called the "task system".⁵⁰ Under this system

Bowker, "Second Nature Once Removed: Time, Space and Representations", *Time & Society* 4 (1995), 47-66; Lewis Mumford, *Technics and Civilization* (New York, 1934), 14-16.

⁴⁴ See, for example, Keletso E. Atkins, "'Kaffir Time': Preindustrial Temporal Concepts and Labour Discipline in Nineteenth-Century Natal", *The Journal of African History* 29 (1988), 229-244; Mike Donaldson, "The End of Time? Aboriginal temporality and the British invasion of Australia", *Time & Society* 5 (1996), 187-207.

⁴⁵ J. D. Lewis and A. J. Weigert, "The Structures and Meanings of Social Time", *Social Forces* 60 (1981), 432-462, Nancy D. Munn, "The Cultural-Anthropology of Time - a Critical-Essay", *Annual Review of Anthropology* 21 (1992), 93-123.

⁴⁶ James Surowiecki, "Punctuality Pays", *The New Yorker*, April 5, 2004, 31.

⁴⁷ On the expansion of European time, see Howse, *Greenwich Time...*, *op. cit.* An example of a discussion about western time's failure is Donaldson, *op. cit.*

⁴⁸ Martin Bruegel, "Time That Can Be Relied Upon / The Evolution of Time Consciousness in the Mid-Hudson Valley, 1790-1860", *Journal of Social History* 28 (1995), 547-564.

⁴⁹ Mark M. Smith, "Counting Clocks, Owning Time / Detailing and Interpreting Clock and Watch Ownership in the American South, 1739-1865", *Time & Society* 3 (1994), 321-339; Mark M. Smith, "Old South Time in Comparative Perspective", *American Historical Review* 101 (1996), 1432-1469.

⁵⁰ Philip D. Morgan, "Work and Culture: The Task System and the World of Low Country Blacks, 1700 to 1880", *The William and Mary Quarterly* 39 (1982), 563-599; Daniel Vickers, "Competency and Competition: Economic Culture in Early America", *The William and Mary Quarterly* 47 (1990), 3-29.

slaves were responsible only for a given quantity of work. Once the "task" was finished, the slaves were free to work for themselves, which encouraged them to develop a time thrift that often led to property accumulation (some slaves bequeathed substantial property to their descendants). Morgan's work has a significant implication to which I will return throughout this essay: if this task system encouraged both time discipline and market relations to appear among the enslaved, then perhaps time discipline appeared in other unexpected places, too.

Gerhard Dohrn-van Rossum and Max Engammare have offered much broader critiques of Thompson. Dohrn-van Rossum has written the finest overall re-interpretation of the time's general history in his *The History of the Hour*.⁵¹ His approach is unique in that he puts the development of a sense for the hour's duration before time discipline itself and notes the many and varied sources of this new sense, including such things as the sixteenth-century Habsburg postal system and Protestant rules on the length of sermons.⁵² In his view, there could be no time discipline without a general, if diffuse, sense for how long the hour should be. The problem with this position is, however, that the hour was redefined in the eighteenth century on principles to which the public no longer had access. Thus, even if the people had a general sense for "an hour", that sense was, ultimately, reified by a system run by specialists.

Engammare, for his part, takes up Protestantism's contribution to time discipline, but in a manner less nuanced than Dohrn-van Rossum's. In *L'Ordre du Temps*, he posits that Calvinism's liturgical approach injected an interest in punctuality into European culture that predated capitalism.⁵³ The connection between this approach and Max Weber's theory of capitalism's origins is obvious.⁵⁴ If Protestantism impelled the Spirit of Capitalism, it also gave birth to time discipline. The root of Protestantism's influence, argues Engammare, was doctrinal. For him, Calvin was deeply impressed with time and made strict attention to its passage normative, and as Calvinism spread, this value went with it. Engammare's work has the problem, however, that not everyone in Europe was Calvinist. In fact, interest in accurate time came to continental countries, irrespective of their confessional status. France, for instance, had an extensive system of public clocks already in the late Middle Ages, and during the eighteenth century developed a clock-making industry

⁵¹ Dohrn-van Rossum, *History of the Hour...*, *op. cit.*

⁵² *Ibid.*, 264-269.

⁵³ Max Engammare, *L'Ordre du Temps: l'Invention de la Ponctualité au XVIe Siècle* (Geneva, 2004). See also Max Engammare, "Organisation du Temps et Discipline Horaire Chez Calvin et à Genève au XVI^e Siècle: Vers Une Spiritualité Temporelle", *Bibliothèque de l'Ecole des Chartres* 157 (1999), 341-367.

⁵⁴ Max Weber, *The Protestant Ethic and the Spirit of Capitalism*, Talcott Parsons trans. (London, 1992).

based in Paris that rivaled Protestant Britain's. The same can be said for northern Italy and Flanders.⁵⁵

The most effective critiques have come, however, from two historians who expressly put "work discipline" into a new context.⁵⁶ Mark Harrison has noted that work discipline predated industrial capitalism in early-modern England. Looking at eighteenth-century Bristol, Harrison argues that city life—not factory life—created time discipline. On the one hand, social life in cities required both a common standard and an awareness of time's passage. How else could one organize public events such as protests or open-air sermons? On the other hand, as Harrison notes, people in Bristol worked regular and long hours (from 6am to 6pm, five days per week) before a single factory had appeared. Paul Hensley has argued that concerns for maintaining social and economic independence, or competency, led colonial-era New Englanders to embrace time discipline.⁵⁷ Here, people valued time for fear of the social opprobrium that went with dependence.

Combining these approaches yields two provisional conclusions on which I will rely later in this essay. First, in the city, some people were temporally disciplined by the task-work that Thompson assumed had *prevented* time discipline. Second, in the countryside, people understood the value of time not because they were working, but because they were *not* working and needed to maintain their standard of living. Even a labor surplus economy could transform time into a commodity. What we have found, therefore, are two alternate forms of time discipline that pre-dated industrialization and emerged from conditions that we would not normally associate with a common outcome. And this suggests a broader hypothesis that I will consider immediately below: although these respective time disciplines had different origins, they were compatible and could be joined together before the dark satanic mills ever arrived. The key question is, of course, how?

Early-modern Germany provides evidence that the assimilation of different time disciplines was already well underway in second half of eighteenth century. Jan Carstensen's work indicates, for example, that after 1770 it became common for peasant households in Westphalia to own large pendulum clocks, especially the type now called *grandfather clocks*.⁵⁸ Often located in the kitchen, the most important room in the house—and on occasion built into the kitchen cabinets—, these clocks would have structured the household's rhythms.⁵⁹ As was the case with the Academy Clock, the

⁵⁵ Landes, *Revolution in Time...*, *op. cit.*, 78-82.

⁵⁶ Harrison, "The Ordering of the Urban Environment...", *op. cit.*; Paul B. Hensley, "Time, Work and Social Context in New England", *The New England Quarterly* 65 (1992), 531-559.

⁵⁷ *Id.* On competency, see Daniel Vickers, "Competency and Competition...", *op. cit.*

⁵⁸ Jan Carstensen, "Die Uhr im Haus: Zur Aufstellung von Bodenstanduhren in Stube, Küche und Entree", in *Zeit vor Augen: Standuhren in Westfalen*, ed. Jan Carstensen and Ulrich Reinke (Münster, 1998), 141-177.

⁵⁹ *Ibid.*

timepiece's location is significant, because people in these homes spent many of their non-working, waking hours in the kitchen. Those accustomed to organizing farm life by the clock were, therefore, in a good position to incorporate time discipline when it arrived in the form of Germany's nineteenth-century trains.

Another example of assimilation comes from 1784, when a controversy about clocks and milkmaids appeared in the *Hannoverisches Magazin*. In the June 1784 issue, a certain N. Beckmann announced:

In both winter and summer all the dairy farmers (Landwirth), who everywhere sell milk to Hamburg in such great quantities, set their clocks (Hausuhr) —perhaps not a full, but certainly a half hour— ahead of the clocks set by honest people. This happens in the Elbmarsch [a region southeast of Hamburg] year after year, and for no other reason than to get the milkmaids up early enough before sunrise to milk the cows...⁶⁰

Beckmann then concluded that the reason for this subterfuge was the desire among Hamburg's women to take fresh milk with their afternoon tea. These charges provoked an indignant response from just such an Elbmarsch dairy farmer, who wrote, "that the clocks here in the Elbmarsch are set just as [they are] in other regions."⁶¹ The debate was never resolved, but it indicates, nonetheless, that a broad discussion about clocks and time discipline was underway. This discussion was possible, because it appeared in the new world of the print sphere. More importantly, however, it signifies the way that print bound together public practices in different places. It was now possible for people in different areas to consider and compare their local practices with those in other areas.

The exchange about Elbmarsch milkmaids is also significant, because it collapses the distinction between city and countryside on which much of the current literature is based. E. P. Thompson has, for example, argued that traditional societies were more attuned to "natural" rhythms.⁶² Yet, as we have seen, cities functioned according to the sun's "natural" rhythm too, and the disciplining of clocks was part of this arrangement, if not fundamental to it. Moreover, urban market forces also permeated the countryside, bringing a discipline with them that mixed with existing local forms. As the abundant literature on proto-industrialization has established, city-based entrepreneurs exploited the countryside's labor surplus through the putting-out system, a process that made time into money for both sides of the economic equation.⁶³

⁶⁰ N. Beckmann, "Ueber die Uhr zu Basel", *Hannoverisches Magazin* (1784), 863-864.

⁶¹ Anonymous, "Ueber die Uhren der Landwirthe in den Elbmarschen", *Hannoverisches Magazin* (1784), 1551-1552.

⁶² Thompson, "Time...", *op. cit.*

⁶³ Leslie A. Clarkson, *Proto-Industrialization: the First Phase of Industrialization?* (Basingstoke, 1985); Sheilagh C. Ogilvie and Markus Cerman, *European Proto-Industrialization* (Cambridge, 1996).

Cottagers did piece-work on their own time, and probably did not work continuously at it, as did factory workers, but their financial needs must have enforced a kind of work-discipline. Given what I have argued above, it may, therefore, be better to ask how industrialization transformed previous time disciplines, rather than inculcated a new one.

Still, a more general historical problem looms, namely that following time discipline like a red thread is anachronistic. In effect, much of the scholarship on time has projected the modern, temporally-regulated identity onto other peoples and times, judging them implicitly by their attitudes toward time discipline. Hence, historians have defined people from other times and places by what they lacked, rather than by what they had —leaving other scholars with no choice but to assume a defensive tone when discussing non-western, pre-industrial peoples' time sense—. This approach has, however, obscured the systems of discipline under which many different peoples —non-westerners, European peasants, etc.— actually worked and has also precluded research into alternate ways of understanding time discipline's origins and development.

In looking for *our* time discipline's origins, we have marginalized other ways of being disciplined by and through time. Consequently, we have failed to appreciate how these alternate paths may have either produced their own forms of time discipline or even contributed to our modern time sense.⁶⁴ Mark Harrison has noted the strange results that the emphasis on uniformity produces even within Thompson's own corpus.⁶⁵ On the one hand, Thompson held that early-modern workers were undisciplined until factories imposed order. On the other hand, Thompson's justly famous work on the English crowd assumed throughout that crowds were disciplined and orderly —that is, they had a "moral economy" — even though contemporary elites characterized their behavior as undisciplined and socially disruptive.⁶⁶ However, as Harrison has shown, people's behavior, in both cases, was governed by a discipline that predated industrial capitalism.

If we shift to a non-Western perspective, more problems appear. Thomas Smith's work on Japanese time sense establishes that the Japanese peasant was disciplined by work before factories ever arrived.⁶⁷ He notes that peasants constructed a system of time thrift that was essential to their survival on the land and, later, in the factories. Moreover, Smith observes

⁶⁴ Smith, "Peasant Time ...", *op. cit.*

⁶⁵ Mark Harrison, "The Ordering of the Urban Environment: Time, Work and the Occurrence of Crowds 1790-1835: A Rejoinder," *Past and Present* 116 (1987). See also the criticisms in David S. Landes, "The Ordering of the Urban Environment: Time, Work and the Occurrence of Crowds 1790-1835", *Past and Present* 116 (1987).

⁶⁶ E. P. Thompson, "The Moral Economy of the English Crowd in the Eighteenth Century", *Past and Present* 50 (1971), 76-136.

⁶⁷ Smith, "Peasant Time...", *op. cit.*

that peasants did not live in tune with nature, but struggled daily against it.⁶⁸ There was nothing “natural” about this form of discipline. He concludes that rural practices traveled with the peasants into urban factories, where labor and management jointly produced modern Japanese time discipline. This position’s broader significance lies in how closely it tracks with Paul Hensley and Mark Smith’s work on colonial New England. In each case, time discipline emerged from a lack of industrial work, rather than a lack of discipline.

Thomas Smith’s work suggests that we need to reevaluate whether peasant or non-Western time senses were so fundamentally incompatible with the European version. It may be fruitful to consider China and other Asian countries along these lines, since scholars have studied clocks and time sense in these areas.⁶⁹ However, by far the greater need for genuine comparison lies in the history of African and Latin American time senses. For example, with the exception of Pierre Bourdieu’s oft-cited work on the Algerian peasant and E. E. Evans-Pritchard’s discussion of the Sudanese Nuer tribe, we know little about African time discipline, whatever its shape and origins.⁷⁰ In fact, the unsuspecting historian who approaches African history solely through the literature on time sense may be excused for believing that Africa—whether northern or sub-Saharan—never produced cities, or merchants, or any form of economic activity beyond primitive agriculture and cattle herding.⁷¹ Moreover, that same historian may also safely overlook that one of this continent’s religions, Islam, included both sophisticated methods of marking time’s passage and a consistent public time signal, the daily call to prayer.⁷²

The situation is even worse for Latin American, as no major works have appeared that deal with the history of time sense there. Indeed, one could make the same comments about the significance of Latin American commercial and religious practices that I just made with respect to Africa. Hence, in general, if religion and market relations played crucial roles in changing medieval

⁶⁸ *Ibid.*

⁶⁹ Joseph Needham, *Time and Eastern Man* (London, 1965); Joseph Needham, Ling Wang, and Derek J. de Solla Price, *Heavenly Clockwork: the Great Astronomical Clocks of Medieval China* (Cambridge, 1986); Joseph Needham, *The Hall of Heavenly Records: Korean Astronomical Instruments and Clocks 1380-1780* (Cambridge, 1986).

⁷⁰ Pierre Bourdieu, "The Attitude of the Algerian Peasant Toward Time", in *Mediterranean Countrymen: Essays in the Social Anthropology of the Mediterranean*, ed. Julian Pitt-Rivers (Paris, 1963), 55-72; E. E. Evans-Pritchard, *The Nuer: a Description of the Modes of Livelihood and Political Institutions of a Nilotic People* (Oxford, 1940).

⁷¹ In these works, European time discipline is assumed to be not only the standard but also wholly foreign to Africa. Atkins, "Kaffir Time...", *op. cit.*; Evans-Pritchard, *op. cit.*; T.C. McCaskie, "Time and the Calendar in Nineteenth-Century Asante: An Exploratory Essay", *History in Africa* 7 (1980), 179-200; Bourdieu, "The Attitude...", *op. cit.*; Munn, "The Cultural-Anthropology...", *op. cit.* An exception is Smith, "Old South Time...", *op. cit.*

Europe's time sense, then historians ought, at least, to consider African and Latin American civilizations from the same perspective.⁷³

None of this is to argue that Asia, Africa, Latin America or European peasants and urban workers are alike in their attitudes toward time. It is to suggest, however, that time discipline's master narrative has limited empirical and comparative research. First, historians have assumed that older systems of time reckoning within Europe were overcome by the new time discipline. Bruegel, Harrison and Hensley's works suggest, nonetheless, that alternate forms of temporal discipline not only predated the new time, but may have contributed to its subsequent form.⁷⁴ Second, those historians who have researched non-western perspectives on time have spent more effort *justifying* "the other's" time sense than investigating it from a comparative perspective. As a result, we do not have much sense for how these non-western approaches worked, or more specifically were related to work; nor do we know whether these alternate systems contributed anything to subsequent western ideas of time.⁷⁵ A new approach to time discipline must not only attack the basic assumption of a radical alterity in pre-industrial life, but must also provide comparative perspectives that eschew the defensive tone that has, too often, turned the legitimate interest in non-western time sense into anti-western critiques.

On those rare occasions when anyone has noted Berlin's Academy Clock, it has been to celebrate it as the city's first master clock (*Normaluhr*), the unquestioned source of a single time.⁷⁶ Strictly speaking, this is incorrect, since Berlin already had an official master clock, the *Domkirche* Clock, by 1679. Moreover, much like its successor in the Academy, the *Domkirche* Clock was the subject of constant public disciplining. This early discipline was, however, different from what came later, and had two primary components. First, a critical public of time consumers monitored the city's clocks for their synchronicity, rather than "accuracy". Second, the authority to establish time's public standard rested with the Elector, and he invested the city's most important church with the right to set the city's time. A look at this master clock's history will reveal that both the mode of time's acquisition and the nature of authority changed during the period this essay covers.

⁷³ Le Goff, *Time...*, *op. cit.*

⁷⁴ Bruegel, "Time That Can Be Relied Upon...", *op. cit.*; Harrison, "The Ordering of the Urban Environment...", *op. cit.*; Hensley, "Time, Work...", *op. cit.*

⁷⁵ One exception is Donaldson, "The End of Time?...", *op. cit.*, who suggests that Aboriginal time actually defeated British time to the point that British settlers began to use Aboriginal ways of calculating the time. See also Smith, "Old South...", *op. cit.*

⁷⁶ anon., "Die Akademieuhr - Berlins älteste Normaluhr: das Chronometer ist im märkischen Museum zu sehen", *Berliner Zeitung*, 17/18 October 1987, Klaus-Harro Tiemann, "'Pro musis et mulis' - das erste Akademiegebäude", *Spectrum: Berliner Journal Für Den Wissenschaftler* (1991), 42-44; Dohrn-van Rossum, *History of the Hour...*, *op. cit.*, 346.

Berlin's public interest in accurate time dates to least a century before the Academy Clock's installation. In 1679, Elector Frederick William I institutionalized Berlin's first time regime with this proclamation:

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—and, moreover, with the clock in the Marienkirche having been ringing mostly wrong and occasionally not at all for the last year, 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 can be prevented.⁷⁷

Fig. 3 is a seventeenth-century image of the *Domkirche* and its public clock. We should note immediately this clock's publicness. Located in a major city structure and overlooking the *Lustgarten*, a public space, in which people are promenading, the *Domkirche* Clock became part of Berlin's daily life.

The Elector's order identifies, roughly, the period during which time became a public issue. Only three years before, in 1676, a clock maker named Michael Kresten had petitioned the consistory for the privilege of replacing the incumbent clock setter, who had fallen ill.⁷⁸ Consistent with the traditional picture of seventeenth-century Berlin as a sleepy princely residence, the consistory affirmed the request without debate and scrawled a note in the margins of Kresten's letter that awarded him the job pending his predecessor's death. However, in 1711, the consistory required a different clock setter to sign a service contract, the first of its kind in Berlin. The contract had seven provisions, though only the second and the fifth will concern us below.⁷⁹

The *Domkirche's* first clock maintenance contract suggests the need for a broader approach to public time that reaches beyond work and the factory system. In seventeenth-century Berlin public practice *and* political power together created the field in which time was apprehended. The government put public clocks in specific places and people used them in those same places. Berlin's temporal public was, thus, called into being through process of mutual recognition between the city's denizens and the local government. Let us consider this process via the second provision, which reads:

⁷⁷ GSta PK, "I. HA Rep. 9, N7, Fasc. 1, Uhrmacher 1661-1702," 13rv. Also quoted in König, *Uhren und Uhrmacherei in Berlin: Geschichte der Berliner Uhren und Uhrmacher, 1450-1900*, 27.

⁷⁸ Brandenburg LHA, "Pr. Br. Rep 10A Domkirche Berlin, Nr 208 Acta betr. die Bestellungen der Uhrmacher und Uhrsteller," (n.p.) April 2, 1676.

⁷⁹ *Ibid.* (n.p) December 11, 1711.

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.⁸⁰

This provision highlights a crucial point for understanding Berlin's time sense. The sun was the ultimate "public" chronometer, because public practice made it so. The distinction is significant, for it reveals how public time pieces had to be accepted by the people who used them. Hence, to anoint one clock as master clock invariably legitimized long-standing public practices.

Time's relationship to public practice becomes clearer, when we consider the *Domkirche's* maintenance procedures. The contract's fifth provision required:

He 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.⁸¹

Getting the time right on Sundays was fundamental to the *Domkirche* Clock's public mission, because a functioning clock helped congregants get to church on time. When time's public mission changed, so too did the nature of turret clocks' authority. In 1814, for example, a preacher at a different church, the *Marienkirche*, complained that his clock was not working properly, with that result that, "neither we nor our neighborhood have a secure norm to act in accordance with..."⁸² Moreover, not being able to point to a standard invited bad behavior. He continued: "almost daily, we see people arrive very late at communions, baptisms, weddings, sermons, etc., and they use the clock's shortcomings as an excuse".⁸³ The *Marienkirche* was (and still is) in Berlin's center, not far from the *Domkirche*. The notion that the local residents had no access to the correct time—either through their own pocket watches or other public clocks—is unbelievable. In fact, the unfortunate preacher was dealing with resistance to his discipline, but in the context of a new system of civic time.

The *Domkirche* Clock's location—in a church, managed by a consistory—imbued it with religious authority, but also made it public. Hence, much like the Academy Clock, it found itself in an ever more tenuous position. As long as public practice stayed within certain boundaries, the *Domkirche* Clock remained a clear standard. However, as Berlin's standard relocated to a place that was based in scientific knowledge, religious clocks lost influence. Indeed,

⁸⁰ *Ibid.*

⁸¹ *Ibid.*

⁸² LAB A Rep. 004, "Nr. 585, Die Uhr und die Glocken der St. Marienkirche, 1767-1875", 28r.

⁸³ *Ibid.*

as the preacher in the *Marienkirche* discovered, since turret clocks were less regular than the Academy Clock, their performance could become a source of resistance to their religious discipline.

The irony is, perhaps, that *Domkirche* Clock's very publicness diminished its role as a standard. If we return to figure 3, we see Berliners promenading in the *Lustgarten* before the church. This square was bounded not simply by religious, but also by royal authority, since the Royal Castle stood on the square's adjoining side. Hence, two prominent buildings created a public space within which Berliners pursued their daily and increasingly secular activities. Some historical context will amplify this point. That public life became livelier and more secular in Berlin due to the city's rapid growth after the Thirty Years' War. In 1650, Berlin had only 6,500 people. By 1700, that number had increased to 70,000. Having more people in the streets made the *Domkirche* Clock an object of more public surveillance.

The extent to which time became a public issue is evident in the machinations of Carl Ludewig Buschberg, a local clockmaker. On January 12, 1776, Buschberg tried to steal the job of setting the *Domkirche* Clock from the incumbent with a letter to consistory that complained of the clock's poor performance.⁸⁴ Criticizing a competitor was standard fare among clock makers. New, however, was Buschberg's invocation of a public in support of his attempted coup. In his letter he noted that people on the street were accosting *him* over the clock's poor performance, even though he was not responsible for it. Not surprisingly, he concluded that suffering public abuse should translate into receiving the maintenance contract. (The letter failed, but Buschberg did get the contract two years later.)⁸⁵ Nonetheless, the point is that Buschberg's instrumental use of the public came, not coincidentally, after pocket watches had become more numerous. As more people acquired personal sources of time, public surveillance of clocks increased, and so did the complaining.

Before continuing, I should note here that this temporal public was extremely limited, being reserved to elite men. Historians have argued that the eighteenth century witnessed the rise of the public sphere, the scourge of repressive governments.⁸⁶ The idea is that as Europeans became wealthier and better educated they cultivated venues that made possible communication and critique. The appearance of public opinion (*öffentliche Meinung*, *l'opinion publique*) as a force made such public communications inherently

⁸⁴ Brandenburg LHA, "Pr. Br. Rep 10A Domkirche Berlin, Nr 209 Anstellung der Domuhrsteller (1773-1858)", 20r.

⁸⁵ *Ibid.*, 21r.

⁸⁶ La Vopa, "Conceiving a Public...", *op. cit.*; 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; Benjamin Nathans, "Habermas' Public-Sphere in the Era of the French-Revolution", *French Historical Studies* 16 (1990), 620-644.

political and, in the end, contributed to the environment in which the French Revolution became thinkable.⁸⁷ However, as Joan Landes has noted, this public was elite and extremely masculine, even if more than a few women participated in its debates.⁸⁸ Thus, we need to consider gender in the context of publicness.

For its part, Berlin's public was elite, well read, and heavily masculine.⁸⁹ The city's most famous enlightened institution the *Mittwochsgesellschaft*, for example, had no female members, and all Berlin's great newspapers, such as the *Berlinische Monatsschrift* and the *Allgemeine deutsche Bibliothek*, were not only edited and written by men but also probably read mostly by them.⁹⁰ In addition, with respect to time, pocket watches were both expensive and a *male* fashion accessory. (There were watches tailored to feminine fashions, but they were much less numerous.) Hence, although the evidence is limited, two tentative conclusions are warranted. The first is that those men who could afford pocket watches were more likely to be part of Berlin's elite.⁹¹ Second, as members of the elite, pocket watch bearers were more likely to participate in eighteenth-century Berlin's public sphere. I note these points, because the archival records ignore gender, always reporting complaints as coming from the public (*das Publikum*). With my earlier points in mind, we can assume, therefore, that early-modern Berlin's *Publikum* was composed mostly of elite men.

Whatever its actual composition, Berlin's temporal public created a new civic time. Confirmation comes from the maintenance contract that Academy of Sciences signed with Christian Moellinger in 1787. In this text the Academy stipulated a new maintenance rhythm under which Moellinger was required to set the clock every Saturday and Monday between 11am and 12pm.⁹² A new time regime had been translated into practice: turret clocks would now be set on Sundays and in accord with the Academy Clock. Nonetheless, that the Academy Clock was set again on Mondays suggests that a separate and

⁸⁷ Keith Michael Baker, *Inventing the French Revolution: Essays on French Political Culture in the Eighteenth Century* (Cambridge, 1990), 167-202. Mona Ozouf, "'Public Opinion' at the End of the Old Regime", *Journal of Modern History* 60 (1988), S1-S21.

⁸⁸ Joan B. Landes, *Women and the Public Sphere in the Age of the French Revolution* (Ithaca, 1988). Janet M. Burke and Margaret C. Jacob, "French Freemasonry, Women, and Feminist Scholarship", *Journal of Modern History* 68 (1996), 513-549.

⁸⁹ Deborah Hertz, *Jewish High Society in Old Regime Berlin* (New Haven and London, 1988).

⁹⁰ On the *Mittwochsgesellschaft*, see Günter Birtsch, "Die Berliner Mittwochsgesellschaft (1783-1798)", in *Über den Prozess der Aufklärung in Deutschland im 18. Jahrhundert: Personen, Institutionen und Medien*, ed. Hans Erich Boecker and Ulrich Herrmann (Göttingen, 1987), 94-112. On the ADB's contributors, see *Allgemeine deutsche Bibliothek* and G. Parthey, *Die Mitarbeiter an Friedrich Nicolai's Allgemeiner deutscher Bibliothek nach ihren Namen und Zeichen in zwei Registern geordnet* (Berlin, 1842). On women in Berlin's public sphere, see Hertz, *op. cit.*

⁹¹ Thompson, *op. cit.* On Berlin, Klöden, *Karl Friedrich von Klödens Jugenderinnerungen*, 40.

⁹² Akademiearchiv, "Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten", 34r.

superior civic time now flowed from that clock. Science had helped to create a field in which the public could assert itself.

Berlin's civic time emerged from three factors. The first was the city's geographic expansion. As Berlin grew beyond its seventeenth-century boundaries, each additional neighborhood received a new church and, usually, a new clock to go with it.⁹³ The second factor I have already noted: population growth. By 1800, once tiny Berlin had reached a population of 170,000, and the increase in consumers meant more pocket watches circulated. The third factor arose out of the growing number of civic interactions. As life in cities became ever more complex, a new time appeared that was urban and rooted in a network of public clocks. Both public clocks and their users existed in an urban space. In order to understand how the relationship between people and clocks emerged, we need to understand the construction and utilization of space with the new urban environment.

The eighteenth century was filled with new spaces. Whether in geography, astronomy, philosophy, art or architecture, a new appreciation for space emerged across Europe.⁹⁴ As Daniel Brewer has noted, this eighteenth-century aesthetic differed, however, not only from seventeenth-century approaches to space but also from our own. In order to recover this older sense of space, now lost to us, Brewer has suggested that historians investigate five fundamental categories: physical space, social space, colonized space, epistemological space and esthetic space. Changes in time sense were intimately related to this new spatial sense. (There is no clearer example than the famous search for longitude, which expressly connected time with global position.)⁹⁵ Brewer's first two categories —physical and social— are most relevant to this essay, and I will use them in this section to show how spatial sense and time sense emerged jointly in eighteenth-century Berlin.

Social space is urban and is rooted in new forms of interaction made possible by the spaces that governments provided. Indeed, contemporaries recognized the significance of city life and began to value urban spaces as things to be enjoyed, discussed, and critiqued. Heinrich Heine's comments about the Academy Clock were, for example, part of a series of articles on Berlin's cultural scene that he wrote for the newspaper *Rheinisch-Westfälische Anzeiger*.⁹⁶ (Heine's ironic tone suggests, nonetheless, that he

⁹³ Here are a few examples of new churches that were outfitted with public clocks: the *Parochialkirche* (1695), the *Friedrichswerdersche Kirche* (1701) and the *Böhmische Kirche* (1737).

⁹⁴ For general thoughts, see Daniel Brewer, "Lights in Space", *Eighteenth-Century Studies* 37 (2004), 171-186.

⁹⁵ Howse, *Greenwich Time...*, *op. cit.*; Dava Sobel, *Longitude: the True Story of a Lone Genius Who Solved the Greatest Scientific Problem of his Time* (New York, 1995).

⁹⁶ On Heine's visit to Berlin, see Heine, *Historisch-kritische Gesamtausgabe der Werke*. On Berlin, Friedrich Nicolai, *Beschreibung der Königlichen Residenzstädte Berlin und Potsdam und aller daselbst befindlicher Merkwürdigkeiten: nebst Anzeige der jetzlebenden Gelehrten, Künstler und Musiker, und einer historischen Nachricht von allen Künstlern, welche vom dreyzehnten Jahrhunderte an, bis jetzt in*

never liked the place.) In general, commentators on city life noted whether the streets were clean; the buildings, attractive; and the cultural life, interesting. In 1779, when the writer and economist Leopold Friedrich von Göckingk visited Berlin, he noted:

As large as this city may be, one easily learns to find one's location, because almost all the streets run straight, [their] names are posted on each corner, and so many large public buildings, ornamented columns, etc., are scattered throughout all of Berlin, that one finds them [to be] the best signposts.⁹⁷

Eighteenth-century Germans, like their contemporaries elsewhere, saw cities as places for public life. They wanted clean streets, open spaces for promenading and pretty things to contemplate along the way, including grand buildings, elaborate town gates, impressive public monuments and accurate public clocks.⁹⁸

Berlin provides an excellent venue for investigating social space's influence, because it produced too many new spaces in a short time. As the city grew, new neighborhoods were built, and new churches and town halls appeared in them. These public structures were, then, usually outfitted with public clocks. Seen from a city-wide perspective, each new clock extended Berlin's temporal network, anchoring daily life in the particular area, while connecting the neighborhood to a greater whole. Most important, however, for this essay was the construction of a new temporal center from which this local network extended. The center took the form of a grand avenue, *Unter den Linden*. The street dated back to 1647, but most of its signature structures were built during the eighteenth and early nineteenth centuries.⁹⁹ By Heine's time, this street was bounded on one side by the *Schloßbrücke* (1822-23), which connected the Linden to the Spree Island, and on the other by the Brandenburg Gate (1788-1791). These structures extended the public space eastward from the original center that was located in front of the *Domkirche* and the Royal Palace. Heine described the new scene thusly:

Berlin gelebt haben, oder deren Kunstwerke daselbst befindlich sind (Berlin, 1779-1786). Other examples of this trend: Johann Gottlob Schulz, *Beschreibung der Stadt Leipzig* (Leipzig, 1784); Philipp Christian Ribbentrop, *Beschreibung der Strassen, einiger öffentlichen Gebäude und der Kirchen der Stadt Braunschweig* (Braunschweig, 1789). Friedrich Groschuf, *Versuch einer genauen und umständlichen Beschreibung der Hochfürstlich-Hessischen Residenz- und Hauptstadt Cassel: nebst den nahegelegenen Lustschlössern, Gärten und andern sehenswürdigen Sachen* (Cassel, 1769).

⁹⁷ Leopold Friedrich von Göckingk, "Briefe eines Reisenden an den Drost von L.B.", *Deutsches Museum* 2 (1779): 71-77.

⁹⁸ Eckhart Hellmuth, "A Monument to Frederick the Great: Architecture, Politics and the State in Late Eighteenth-Century Prussia", in *Rethinking Leviathan: The Eighteenth-Century State in Britain and Germany*, ed. John Brewer and Eckhart Hellmuth (Oxford, 1999), 317-342.

⁹⁹ For a contemporary description of Berlin's buildings, see Nicolai, *op. cit.*

Truly, I know of no more imposing view than to stand before the Dog's Bridge [replaced by the Schloßbrücke] and to look up to the Linden. On the right, the magnificent Armory, the Neue Wache, the University and the Academy. On the left, the Royal Palace, the Opera, and the Library, etc. Here one magnificent structure (Prachtgebäude) after another are packed closely together. Everywhere ornamental statues, though badly chiseled and in bad stone.¹⁰⁰

In 1840, Karl Gutzkow (1811-1878), the nineteenth-century novelist and native-born Berliner, added his impression of this area:

From my apartment I am afforded a view of the area around the castle, [that is] on a glut of large buildings, which make the area between the start of the Linden and the Dom one of the most remarkable plazas in Europe.¹⁰¹

Indeed, consistent with what we see in figures 1 and 3, this plaza and *Unter den Linden* together became a new cultural scene, in which "the beautiful people" went for a walk. Of course, the beautiful people were probably not on their way to factory jobs, a supposition that leaves us with two parallel questions: first, why would these people check the time in such a public manner? Second, why did they shift their loyalties from the *Domkirche* Clock to the Academy Clock?

During the eighteenth century, checking the time in public became a form of social distinction. This was due, in part, to the pocket watch's status as a luxury item. Nonetheless, another key factor, the one on which I will concentrate was science's growing public presence. After all, the public had to choose to go to a scientific institution to get the "correct" time. I will pursue the changing public behavior from two perspectives. First, I will consider the public effect of science through its architecture. Second, I will consider science in the public sphere. These two things together put eighteenth-century Berlin's time regime into a new context, contributing to its transformation.

Berlin's cultural life was deeply affected by science's growing presence *in the city*.¹⁰² In 1701, the Royal Academy of Sciences' was founded and acquired laboratory space in the former royal stables on *Unter den Linden*. Although the building was not well appointed, and the horses still occupied the ground floor, science now had a physical presence in town.¹⁰³ The Academy well understood how important a physical presence was for its public image. For example, three times during the period covered by this essay—in 1728, 1745 and 1809—the Academy arranged night-time illumination for its building in

¹⁰⁰ Heine, *op. cit.*

¹⁰¹ Karl Gutzkow and Wolfgang Rasch, *Berlin-Panorama einer Residenzstadt* (Berlin, 1995).

¹⁰² I have taken this idea from Sven Dierig, Jens Lachmund and J. Andrew Mendelsohn, *Science and the City*, vol. 18, Osiris (Chicago, 2003).

¹⁰³ Tiemann, "'Pro musis et mulis' - das erste Akademiegebäude".

honor of a dignitary's visit.¹⁰⁴ By burrowing into a public space, the Academy of Sciences became as important part of local culture as the *Domkirche* had been. Nonetheless, this space was different from older ones and new rules applied.

Science's local importance derived strength from its connection to wider German phenomenon, namely that state support for science had become a strategy for princely aggrandizement. It was especially during the eighteenth century that scientific societies of all types appeared around Germany, the most famous being the Berlin Academy.¹⁰⁵ One result of growing princely support was astronomy's rise to prominence in Germany. In 1711, when the Academy's observatory was completed—the first state-supported observatory to be built in Germany—, astronomy became the discipline most obvious to the public eye.¹⁰⁶ (See figure 4.) The same development was evident across Germany, as from 1711 until 1811, eighteen professional observatories appeared.¹⁰⁷

Astronomy put down roots through its buildings. In the same way that turret clocks became part of a city-wide network, eighteenth-century observatories created a network of knowledge, but this one was based simultaneously in the print sphere and local practices. As astronomy became a widely dispersed science, it also dispersed the values that, ultimately, changed time into knowledge, making it fundamental to changes in the nature of time discipline. The same phenomenon was visible elsewhere, as during the nineteenth century astronomers became the unquestioned source for public time in both Europe and the United States. In Berlin, a corporation named *Normalzeit* even appeared that sent the Berlin Observatory's time to subscribers around the city via electrical lines.¹⁰⁸ Now I turn my attention to astronomy's rise in the print world and consider its effects on public attitudes toward time.

Science existed in social space, but it also shaped new ways of understanding physical space. It did this through the public sphere, as a slew of books appeared throughout the eighteenth century on the new (Newtonian)

¹⁰⁴ BBAW Akademiearchiv, "Bestand I., Abth. II., Nr. 24 Volumen Actorum betreffend die Illumination bey Gegwarth des Königs von Polens Majestät in Anno 1728 und die von 1745.", BBAW Akademiearchiv, "Bestand I., Abth. II., Nr 28 Illumination des Academie-Gebäudes bei der Ankunft Sr. Majestät betreffend, 1809".

¹⁰⁵ On Germany in general, see Ludwig Hammermayer, "Akademiebewegung und Wissenschaftsorganisation während der zweiten Hälfte des 18. Jahrhunderts," in *Wissenschaftspolitik in Mittel- und Osteuropa*, ed. E. Amburger (Berlin, 1976). On the Berlin Academy, see Adolf von Harnack, *Geschichte der königlich preussischen Akademie der Wissenschaften zu Berlin*, vol. 1 (Berlin, 1900).

¹⁰⁶ Germany also had private observatories such those of Wilhelm Olbers' in Bremen (1781), Nathanael von Wolf's in Danzig (1785), Johann Schröter's in Lilienthal (1793). On observatories in Germany, see Rainer Baasner, *Das Lob der Sternkunst: Astronomie in der deutschen Aufklärung* (Göttingen, 1987), 28-31.

¹⁰⁷ Rainer Baasner, *op. cit.*, 29-30.

¹⁰⁸ *Meyers Grosses Konversations-Lexikon*, 6 ed., vol. 14 (Leipzig and Vienna, 1909), 783.

physics.¹⁰⁹ By 1750, print was a major contributor to the diffusion of science among a non-specialist public. Berlin partook deeply of this trend, because it was indisputably a center of the German public sphere, boasting a lively publishing industry as well as a network of social clubs, such as the *Mittwochsgesellschaft*, the *Montagsklub* and several Freemasonic lodges.¹¹⁰

Science was part of Berlin's intellectual world, and on multiple levels, too. The Academy of Sciences not only published its proceedings and star charts (*ephemeriden*) but also had a monopoly on the publication of all calendars, including astronomical ones, about which I say more below.¹¹¹ The Academy of Sciences' chief astronomer, Johann Elert Bode, published a number of works on astronomical topics, including a German translation of Bernard de Fontenelle's fundamental and wildly popular pedagogical text *Entretiens sur la Pluralité des Mondes*.¹¹² The Academy also featured both regular public lectures and a coffee house in which scientific topics were presented and

¹⁰⁹ On science and the public sphere, see Broman, "The Habermasian Public Sphere...", *op. cit.* On the rise of Newtonianism in Germany, see Thomas Ahnert, "Newtonianism in Early Enlightenment Germany, c. 1720 to 1750: Metaphysics and the Critique of Dogmatic Philosophy", *Studies in the History of the Philosophy of Science* 35 (2004), 471-491. A famous example of Newtonianism's spread is Immanuel Kant, *Allgemeine Naturgeschichte und Theorie des Himmels: oder Versuch von der Verfassung und dem mechanischen Ursprunge des ganzen Weltgebäudes nach Newtonischen Grundsätzen abgehandelt* (Königsberg, 1755).

¹¹⁰ Ursula Goldenbaum, "Der 'Berlinismus': Die preussische Hauptstadt als ein Zentrum geistiger Kommunikation in Deutschland", in *Aufklärung in Berlin*, ed. Wolfgang Förster (Berlin (East), 1989), 339-386; James Schmidt, "The Question of Enlightenment: Kant, Mendelssohn, and the Mittwochsgesellschaft," *Journal of the History of Ideas* (1989), 269-291; Gustav A. Sachse, ed., *Der Montagsklub in Berlin 1749-1899: Fest und Gedenkschrift zu seiner 150sten Jahresfeier* (Berlin, 1899); Erich Steffen, "Ein Klub im alten Berlin", *Alt-Berlin: Mitteilungen des Vereins für die Geschichte Berlins* (1910), 119-121. On Freemasonry in Prussia, see Karlheinz Gerlach, "Die Freimaurer im mittleren Brandenburg-Preussen 1775-1806 - Geschichte und Sozialstruktur", in *Fridericianische Miniaturen 3*, ed. Juergen Ziechmann (Oldenburg, 1993), Karlheinz Gerlach, "Die Berliner Freimaurer 1740-1806. Zur Sozialgeschichte der Freimaurerei in Brandenburg-Preussen", in *Europa in der Frühen Neuzeit. Festschrift für Günter Mühlhpfordt: Band 4. Deutsche Aufklärung*, ed. Erich Donnert (Weimar, 1997), 433-453.

¹¹¹ BBAW Akademiearchiv, "Bestand I., Abth. VIII., Nr. 14 Calender-Sachen, 1732-1744", BBAW Akademiearchiv, "Bestand I., Abth. VIII., Nr. 49 Acta die Streitigkeiten dem Wolfgangischen Erben mit den Calender-Pächtern wegen Ablieferung von 50 Stück Genealogischen Calendern und Auszahlung ihrer Pension betreffend, 1785-1789, 1795", BBAW Akademiearchiv, "Bestand I., Abth. VIII., Nr. 56 Calender-Wesen vom Jahr 1789 bis 1790, während der Pacht des Herrn Siwieke", BBAW Akademiearchiv, "Bestand I., Abth. VIII., Nr. 57 Kalender-Sachen, 1790-1794".

¹¹² Johann Elert Bode, *Anleitung zur Kenntniß des gestirnten Himmels auf jede einzelne Monate des Jahres eingerichtet* (Hamburg, 1768); Johann Elert Bode, ed., *Astronomisches Jahrbuch für das Jahr 1784. nebst eine Sammlung der neuesten in die astronomischen Wissenschaften einschlagenden Abhandlungen, Beobachtungen und Nachrichten* (Berlin, 1781); Johann Elert Bode, *Von dem neu entdeckten Planeten* (Berlin, 1784). Bernard Fontenelle, *Bernhard von Fontenelle Dialogen über die Mehrheit der Welten: Mit Anmerkungen und Kupfertafeln / von Johann Elert Bode, Astronom der Königl. Akademie der Wissenschaften zu Berlin* (Berlin 1780).

discussed.¹¹³ Finally, the Academy's Great Chamber (*Großer Saal*), which adjoined the foyer onto which the clock's inner face looked, became a sought-after location for public meetings of all types, including student examinations.¹¹⁴ Science was, therefore, a broad and continual presence in Berlin's daily life.

Science and daily temporal practice in Germany first converged in the astronomical calendar. Such calendars were very popular, appearing across Germany, with each version allowing people to find the local time via solar observation.¹¹⁵ This could be done using a sundial, but a sextant that had come with the calendar was also used.¹¹⁶ Based on the observer's geographical knowledge, he would take a reading of the sun's position on the horizon, consult the charts, and then calculate the time. (The calendar told the user what angle the sun was at with respect to the horizon at local noon.) These calendars were not, however, simply practical guides to setting the time, but also served as pedagogical tools. Indeed, in 1748 one member of the Academy of Sciences in Berlin called for giving calendars an expressly pedagogic role, arguing that the Academy should reform its calendars because:

The public could gain much instruction for a better understanding of natural things, and would, at the same time, be freed from various gross and harmful errors...¹¹⁷

Given what was required of the user, using one of the Berlin Academy's calendars—or any other calendar—must have inculcated a general sense for Prussia's, if not Berlin's, global position. In this way, in Berlin and in many

¹¹³ On the Academy's role in the scientific world, see Mary Terrall, "The Culture of Science in Frederick the Great's Berlin", *History of Science* 28 (1990), 333-364. On the coffee house, see Tiemann, "'Pro musis et mulis' - das erste Akademiegebäude".

¹¹⁴ BBAW Akademiearchiv, "Bestand I., Abth. II., Nr. 29 Acta den runden Vorsaal der Academie betreffend, 1793-1805-1812".

¹¹⁵ For Berlin, *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). For Silesia, *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). For Mecklenburg, *Verbesserter Astronom- und Physicalischer Mecklenburgischer Calender: auf das Jahr*, (Rostock, 1709).

¹¹⁶ Friederich Christoph Müller, *Tafeln der Sonnenhöhen nebst einem Sextanten zum Gebrauche im gemeinen Leben, um dadurch auf eine genaue und bequeme Art die wahre Zeit zu erfahren, die Uhren nach der Sonne zu stellen, und richtige Mittagslinien zu ziehen. Für alle Oerter Deutschlands und der angränzenden Lander deren Polhöhe zwischen 51 und 52 Grad Fällt* [(Schwelm) (1787)].

¹¹⁷ BBAW Akademiearchiv, Bestand I., Abth. VIII., Nr. 23 Volumen Actorum betreffend der in Anno 1748 approbirten Vorschlag zu Verbesserung des Kalender, 13rv.

other German areas, time sense became joined with a sense of geographic space.

As time became more important during the eighteenth century, sundials gained in importance, as well.¹¹⁸ Two things were behind this trend. First, solar observation was homologous to astronomical observation: amateur dialers pointedly observed heavenly phenomena using scientific instruments, which included their pocket watches. Each time a clock watcher consulted a public or pocket sundial, he not only checked the time but also observed the natural world. Second, as public observation became more intense, time and place became deeply intertwined. Figure 5 suggests how they were connected. The image is from the frontispiece of an encyclopedia on clock making that was published in ten volumes out of Leipzig, beginning in 1793.¹¹⁹ This is classic Enlightenment iconography, as *Ratio* (probably) worships the truth emanating from the sun. In addition, the muse has a series of tools for locating herself, including a globe, a clock, an astronomical calendar and a sextant. This arrangement represents what I call a “public” scientific approach to time. Based on clocks, the public approximation of scientific practice, and a sense of place, the Academy Sundial produced an alternate form of knowledge that served the public until the government had it removed.

¹¹⁸ A. J. Turner, "Sun-Dials: History and Classification", *History of Science* 27 (1989), 303-318.

¹¹⁹ J.G. Geißler, *Der Uhrmacher, oder Lehrbegrif der Uhrmacherkunst* (Leipzig: Crusius, 1793-1799).

Conclusion

Most studies of time discipline see the shift away from the sun as a fundamental moment in the history of time sense. This shift was, indeed, of great import, but not for the reasons scholars have assumed. In general, scholars have held that the shift away from the sun implies a less “natural” way of apprehending time.¹²⁰ Evidently, those people who reckon time by the sun are closer to nature. This position is problematic in three respects. First, on a theoretical level, historians of science long ago dispensed with the boundary between natural and unnatural. Nature is *always* constructed, which renders any such dichotomy historically useless.¹²¹ Second, eighteenth-century practice undermined this dichotomy. Astronomers reckoned the time by measuring the earth’s rotation with respect to a star. Having obtained certain knowledge of the exact time, they would then pass it to the local clock setter, who put that knowledge on public display. (In Berlin’s case, the astronomer was Bode and the recipient Christian Moellinger.) Whatever else one may say about this system, it is hardly clear that observing the stars is a less “natural” practice than checking the sun. Finally, as we have seen, Berliners also made the sun an object of scientific scrutiny, using calendars and instruments to observe the correct time.

In any event, the natural-unnatural boundary obscures what really changed. During the eighteenth century, time did not become less natural, but less publicly accessible. Changes in Berlin’s time regime represent a change in the structure of knowledge, and not the abandonment “nature”. If we reflect on Berlin’s experience with the Academy Sundial, time’s local connection becomes apparent. The sundial’s sophisticated design, the Academy Clock’s supposed accuracy and Academy’s scientific prestige all combined to make sun-based time a form of public scientific time. The emergence of time discipline and, I should note, the shift from true time to mean time is, therefore, not a question of progress, but of a tension between competing systems of knowledge, both of which were inspired by science. This has three implications. First, Berlin’s sundial was a disciplinary device, people used it to discipline their clocks. Second, this temporal discipline became more intense as it joined a global imagination that was linked to the print world. Finally, people lost the ability to discipline their clocks when time’s foundations shifted from the sun to the stars and the state mandated it as knowledge. From that point on, there could no longer be an Academy Sundial, or an alternate understanding of time.

¹²⁰ E.P. Thompson’s article is the classic example, though he surrounds the word natural with quotation marks. Thompson, *op. cit.*

¹²¹ Lorraine Daston, “The Nature of Nature in Early-Modern Europe”, *Configurations* 6 (1998), 149-172. See also Foucault, *The Order of Things...*, *op. cit.*

The novelist Karl Gutzkow (1811-1878) was born in Berlin and grew up in an apartment in the Academy of Sciences. In 1852, he published *Aus der Knabenzeit (From My Childhood)*, a collection of his childhood memories, and among them was this description 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... 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.¹²²

Gutzkow's reminiscence puts the Academy Clock not merely at the center of Berlin's public life, but also at the heart of a new scientific worldview—a view even Berlin's preachers seem to have shared—. In connecting time discipline so clearly with science, Gutzkow highlights the substantial changes in the nature of knowledge on which modern time discipline was based. Berlin's public no longer critiqued its public clock, because it had no alternative knowledge sources; it could either obey the clock or ignore it, nothing more.

Berlin's experience with the Academy clock has gone largely unnoticed, but its history has broader implications. First, although much has been written about the rise of the eighteenth-century public sphere, no one has connected temporality with publicness. This is unfortunate, since public time comprised a rich collection of practices that were central to life in the public sphere. Getting Berlin's clocks right was a matter of debate, both verbal and in print, and this local debate was deeply entwined with a national print discussion about clocks. In addition, the act of getting the time was itself a very public ritual, which Berliners performed for an audience each time they pulled out their pocket watches. Time was, thus, an issue at a number of levels, and a close examination of its local history offers new ways to explore the relationship between print debates and local practices.

The Academy sundial's demise transformed the Academy Clock into Karl Gutzkow's Archimedean point. Modern time discipline required a common, unimpeachable standard, and that only appeared in Berlin after the Prussian state established science's right to determine the correct time. As a result, the Academy Clock became the only source for Berlin Time, which was the standard on which Prussia's trains ran until the mid-19th century. Before this state intervention, however, Berliners disciplined all public clocks, including the Academy clock. That the public vision of time lost out is important to the

¹²² Karl Gutzkow, *Aus der Knabenzeit* (Frankfurt am Main, 1852), 5-6.

history of time discipline, but not because it represents time discipline's progress; more important is how it highlights the ways that city life produced and, ultimately, destroyed competing forms of knowledge about the world.

Figures

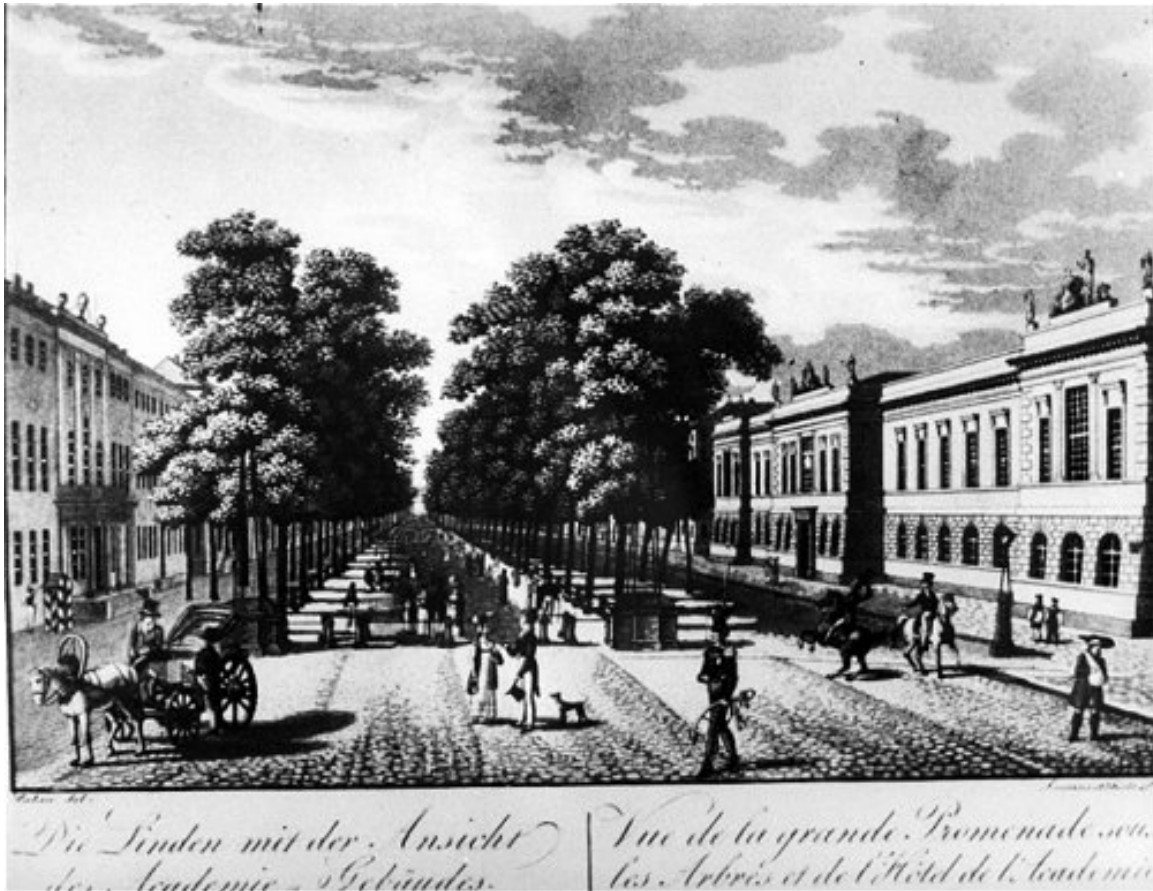


Fig. 1¹²³

*Unter den Linden with Academy of Sciences (ca. 1787)
(The clock and the Academy building are depicted on the right-hand side. The clock is the small circle over the main entrance.)*

¹²³ BBAW Akademiearchiv, "Akademie-Gebäude (mitte 18. Jahrhundert-1903)", 5a.

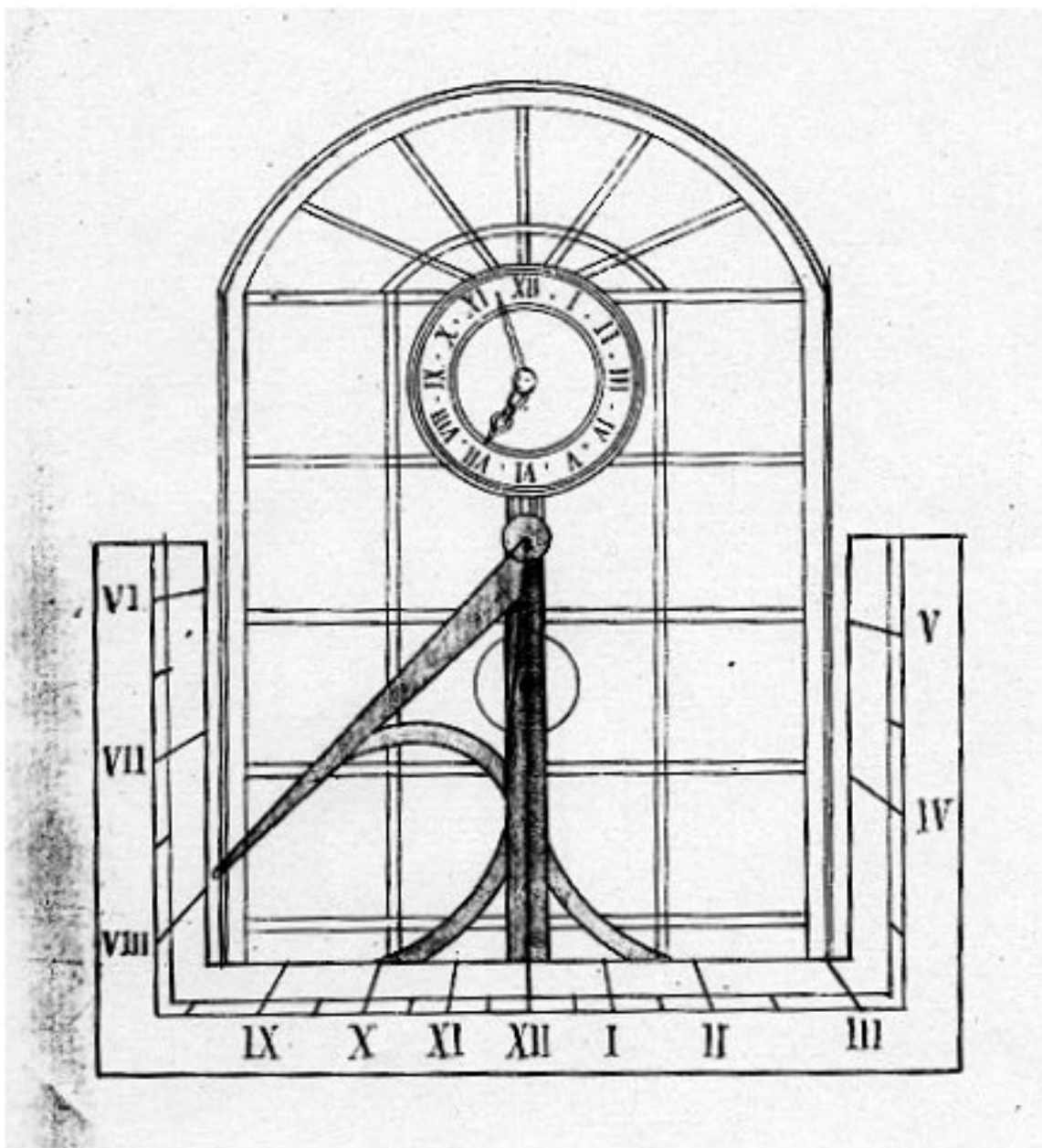


Fig. 2¹²⁴

Academy Clock with Sundial (1793)

¹²⁴ Akademiearchiv, "Bestand I., Abth. III Nr. 105 A, Personalien der Mitglieder und Officianten", 114.



Fig. 3¹²⁵

Domkirche (ca. 1690)
(*The Domkirche and clock are on the left.*)

¹²⁵ Image taken from "Postkarten Sammlung", in *Zentrum für Berlin-Studien* (Berlin). I should also note that this image is of the first *Domkirche*. Frederick II (1740-1786) had this church torn down before it collapsed and put a pleasing baroque edifice in its place. William II (1888-1918), in turn, replaced Frederick's church with the eyesore that still stands.

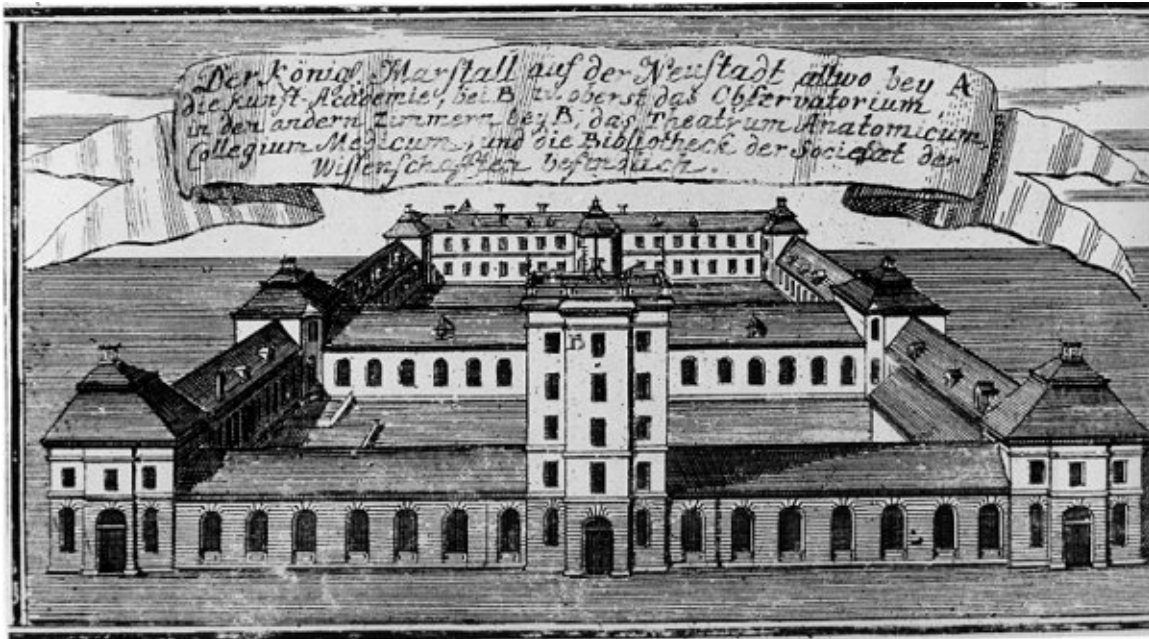


Fig. 4¹²⁶

The Berlin Academy from the rear
(The tower at the front of the image contains the observatory. The Academy Clock was installed at the opposite end of the building.)

¹²⁶ Akademiearchiv, "Akademie-Gebäude (mitte 18. Jahrhundert-1903)", 2a.

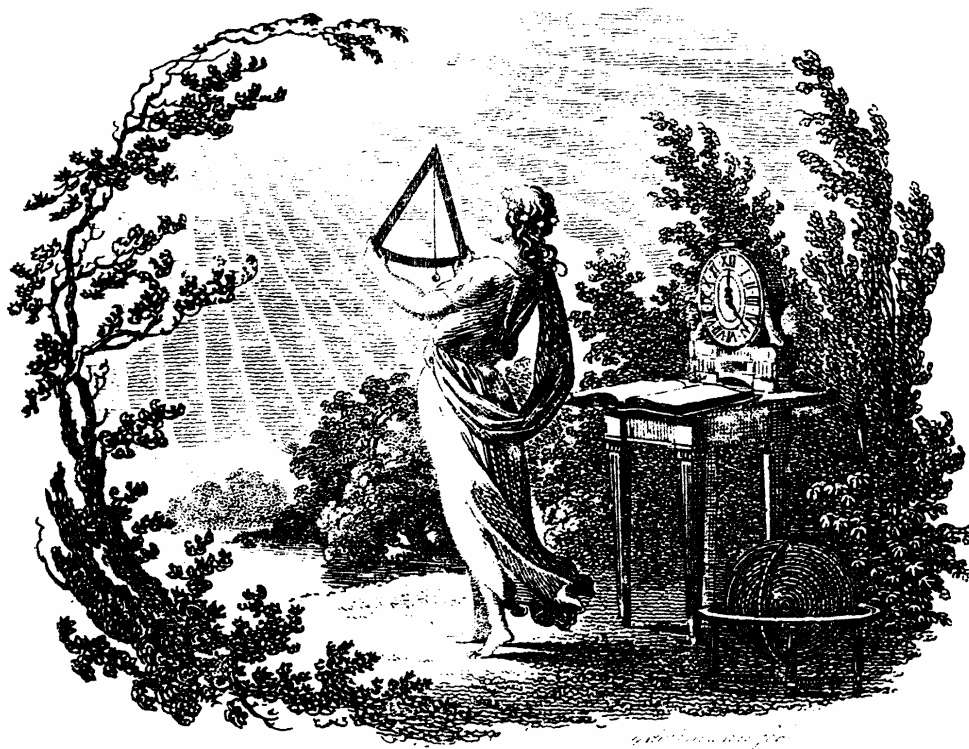


Fig. 5¹²⁷

Frontispiece to J. G. Geißler, *Der Uhrmacher oder Lehrbegrif der Uhrmacherkunst* (Leipzig: Crusius, 1793)

¹²⁷ J. G. Geißler, *Der Uhrmacher oder Lehrbegrif der Uhrmacherkunst*, 10 vols. (Leipzig, 1793).

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