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The Improvement Police

Nehemiah Grew on Knowledge, Nature, and Power

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▼ **ABSTRACT** Studies of England's path to industrialization often stress the significance of natural resources, knowledge, or power, but an early-eighteenth-century manuscript's proposal for national wealth stressed instead the relationship, not the choice, between these factors. Its author, Nehemiah Grew, a former secretary of the Royal Society and prominent authority on plants, argued in 1706 that the state should authorize, disseminate, teach, and mandate the application of natural knowledge to farming, mining, trade, and manufacture. State officers would collect and explain scientific research—knowledge that would support supervision over and interventions into land management, work, consumption, and family life. While Baconian "improvement" in England in the seventeenth and eighteenth centuries is often seen as amateur and voluntary, Grew envisioned a state actively instructing its people in mandatory best practices and disciplining their behaviors. Properly armed with state power, science would make England's people happy, its monarch invincible, and "there will be inventions new and infinite to the end of the world." The beneficiaries of such policy was presented as a "public" that was distinct from England's people, comprised instead of quantifiable and taxable wealth. Grew's rhetoric worked to obscure his relationship to early modern projects, presenting instead the disinterested expertise characteristic of later Enlightenment political economy.

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How did England become the first industrialized society, creating unprecedented wealth and placing unprecedented strains on human societies and natural environments? For subjects of Elizabeth I living around 1600, that this question would be asked 200 years in the future would have been unimaginable. For them, Prometheus remained bound, and the world remained fallen: sufficient food was not assumed, as dearths blighted the 1590s. The economy was gradually diversifying, with regions increasingly specializing in market-oriented farming, textile manufacturing, or mining, which made most English workers dependent on wages long before the emergence of factories. But subjects of the Tudors did not expect such work radically to transform their lives or England's place in the world. Utopian societies without poverty, illness, and the mutual resentments of inequality could only be imagined in lands such as Bacon's New Atlantis, not in England's own future. And yet dreams for such goals (such as "inventions new and infinite to the end of the world" to be achieved "if we please") arose during the next 200 years and were set in England itself, helping the British envision an industrial society before they created one.[1] This discussion focuses on one such plan, submitted to the monarch at the beginning of the eighteenth century, which proposed to make the English state powerful by making its people and land productive. It was a plan that drew on burgeoning dreams of unlimited growth, an agenda which recent scholarship has emphasized, but it sought to achieve this through extensive state interventions in the circulation and application of knowledge. Seemingly impossible goals could be achieved, according to one of England's leading natural philosophers, only through a mandatory system of best practices: an improvement police.

Knowledge and Improvement During England's Long Industrial Revolution

Explaining England's emergence as the self-proclaimed workshop of the world, as the first society to take the irrevocable step into modern modes of economic production, class politics, and, for more recent analysts, the catastrophically unsustainable Anthropocene, is an urgent question.[2] Three main axes of analysis have emerged, stressing alternately resources, politics, and knowledge, often

1 Hoppit, *Nehemiah Grew*, 52, 65.
2 A historiographical review foregrounding environmental themes is Jonsson, "Industrial Revolution."

in combination but not infrequently presented as distinct variables whose distinct contributions must be evaluated.

Resources are stressed by those who distinguish what geography made possible in England from what was impossible elsewhere, despite the claim from some scholars that attention to geography appears dangerously close to elevating coincidence over real causation. Without abundant coal, England's industrialization could not have proceeded as it did, as the early modern economy had ecological limits that only subterranean reserves could overcome.[3] The English economy became "exceptionally energy-intensive" compared to anywhere else in the world by 1800.[4] Cheap coal, coupled with expensive labor, is central to a leading structural explanation for technical innovation.[5] Fuel availability has been used to help explain why two of the early modern world's richest commercial regions, the Yangtze valley and Bengal, declined relative to Britain after 1800, as neither combined the motive and resources allowing them to stumble into coal-fired development.[6] The "ghost acres" provided by England's expanding colonies, where soil fertility often stemmed from long-standing and unacknowledged indigenous management, and where some labor was cheapened through the violence of slavery, added to England's competitive advantage. This approach stresses that English manufacturing enjoyed cheap energy and cheap commodities, while economies with scarce land and expensive or less efficient human labor eventually could not compete.

These accounts rarely ignore the state entirely, and other scholarship places policy front and center. The British state—like its European competitors—sought to limit imports of finished Asian cotton textiles and to nurse domestic industries, making its booming success in textile manufacture a kind of state-sponsored project to supplant Indian methods.[7] But cottons were not the only industry to benefit from this visible hand; excise taxation rewarded economies of scale in a range of manufactures, and substantial government investment in armaments on an imperial scale supports a claim that "war made the industrial revolution."[8] So did slavery, as it was primarily unpaid labor rather than natural endowments that made commodities such as sugar and fibers cheap.[9] Even the coal economy itself required state support in the form of protection for shipping and political tolerance for smoke pollution.[10] More broadly, England's relatively early centralization, compared with Europe's composite and decentralized states, contributed to its economic integration

3 Wrigley, *Path to Sustained Growth*.
4 Warde, "Modern Energy Regime," 140.
5 Allen, *British Industrial Revolution*.
6 Pomeranz, *Great Divergence*; Parthasarathi, *Why Europe Grew Rich*.
7 Riello, *Cotton*.
8 Ashworth, *State, Knowledge, and Global*; Satia, *Empire of Guns*, 2.
9 Berg and Hudson, *Slavery, Capitalism*.
10 Cavert, *Smoke of London*.

and resulting efficiencies.[11] Empire was often central to such choices, as navies secured access to markets and thereby a positive balance of trade, and settler colonialism, enslaved labor, and ecological destruction lowered the costs and increased the abundance of raw materials. Those aspects of imperial political economy labeled "mercantilism"—like their internally focused continental analogues labeled "cameralism"—were attempts to manipulate trade relationships and productive labor using the state's powers to regulate, tax, coin, and wage war.[12]

A third strand of scholarship stresses that what made eighteenth-century Britain truly exceptional was knowledge, in particular an industrial enlightenment and the embracing of bourgeois values. A culture newly devoted to attaining and enjoying wealth was determined to understand how to use natural resources such as coal, political assistance such as tariffs, and captive imperial markets. A new ideology of "improvement" actively searched for and celebrated new ways to invent, produce, and employ, spawning innumerable inventions.[13] This literature sees both power and resources as downstream from knowledge, innovation as dependent on desire. It also sometimes implies (or even explicitly claims) that the English stumbled upon the single best path to wealth regardless of historical circumstance. Twinned with the new embrace of productivity was giddy consumption, as working to afford market goods became associated with respectability.[14] Some of this work is triumphalist, but others find that early modern Britain's knowledge regimes were central to modern economic life in ways that were destructive and exploitative.[15]

In its more strident registers, this debate asserts the primacy of one theme over the others.[16] But in early modern England, such analytical distinctions between knowledge, power, and natural resources would usually have appeared unhelpfully limiting, or even meaningless. A focus on projecting shows why demanding such choice is misplaced, as industrialization itself was a kind of long-term and unfocused project, one in which the *relationships* between power, knowledge, and resources—not the primacy of just one—was key.[17] A relatively little-known tract by a botanist, written halfway between the anxious fears of the 1590s and the confident expansionism of the early nineteenth century, offers an illuminating window into the importance of these connections as they were emerging in the early eighteenth century. It advocated with unapologetic clarity for highly invasive state power to foster new relationships

11 Grafe, *Distant Tyran*ny.

12 Recent critical engagements with both concepts include Stern and Wennerlind, *Mercantilism Reimagined*; Barth, "Reconstructing Mercantilism": Rössner, "Cameralism, Capitalism" and Magnusson, "Cameralism as *Sonderweg*."

13 Mokyr, *Enlightened Economy*; Slack, *Invention of Improvement*; Jacob, *First Knowledge Economy*.

14 De Vries, *Industrious Revolution*; Berg, *Luxury and Pleasure*.

15 Keller, *The Interlo*pers.

16 McCloskey, *Bourgeois Dignity* makes such claims into chapter titles.

17 Keller et al., "Projects in the History."

between knowledge, labor, and resources, demonstrating the intentionality with which many in England pursued explosive economic growth. This ambitious vision of wealth and improvement, of the kind that was central to early modern projecting, did not rely on geographical luck, or on an insistence that either smart policy or technical expertise must be primary. Instead, it stressed openly what other projectors often ignored or downplayed: that economic growth was best achieved by applying coercive state power to the practical knowledge of natural resources.

Nehemiah Grew and the Natural Philosophy of Improvement

In a manuscript tract of c. 1706 labeled "The Means of a Most Ample Increase of the Wealth and Strength of England," Nehemiah Grew argued that England could achieve riches and power through a coordinated policy of broad-based improvement, which would create a manufacturing economy whose booming wealth could easily be tapped by the Crown for defense and magnificent display.[18] Grew held a doctorate in medicine, was England's leading botanist, and had catalogued the Royal Society's collection, a career which helps explain the extraordinary prominence that his *Means* granted to the preservation, presentation, management, and circulation of natural knowledge.[19] It envisioned the joint expansion of English agriculture and manufactures, each reinforcing the other as labor worked the land, producing raw materials for further labor. It offered growth targets that were, though not quite infinite, very far above the early-eighteenth-century *status quo*. While some commentators have dismissed his figures as "cavalier" or even absurdly unrealistic, his quantification was part of an important development from the rhetoric of infinity.[20] While seventeenth-century projectors within or under the influence of the Hartlib circle emphasized that improvement and enrichment could be literally endless, Grew proposed specific numbers.[21] Even if his figures were often (though not always) grandiose, their specificity made them an example of the probabilistic epistemologies typical of projects. This volume's editors stress that probabilism, and the failure to meet enumerated goals, was entirely typical of early modern projecting, making Grew both an ancestor of modern economists and

18 Three manuscripts are known to exist: the two discussed by Hoppit, Henry E. Huntington Library Manuscript HM1264 and British Library Lansdowne Manuscript 691, and University of London Senate House Library MS 84. This discussion is based on the Huntington text, as well as Hoppit's edition, which is cited in notes and parenthetical citations for convenience. Spelling, capitalization, and punctuation are standardized in quotations. Grew's proposal is not unknown, but the only detailed analyses are Hoppit's editorial introduction and the teleological assessment of Johnson in *Predecessors of Adam Smith*, 117–38.

19 Hunter, "Grew, Nehemiah." Roos, "Doctoral Dissertation" nicely summarizes Grew's place in the historiography of natural philosophy.

20 Hoppit, *Nehemiah Grew*, xli.

21 For infinite growth, see McCormick, *Human Empire* and Jonsson and Wennerlind, *Scarcity*.

an example of how their methods are built upon the shaky foundations of the projector.[22]

To reach such levels of wealth required, Grew claimed, not an ideological choice between land or labor, nor privileging resources, knowledge, or power, but rather new relationships between them all. Grew's priority was thus not new ideas, leading historians of economics focusing on the evolution of theory to ignore him, and his most attentive critics, Johnson and Hoppit, even to find him guilty of plagiarizing a host of mid-seventeenth-century authors and of ignoring leading political economists of the 1690s.[23] This is partly fair, as *The Means* is an imperfect compendium of uncredited borrowings. But one reason it shows no interest in recent authors was that such eminent figures as Charles Davenant, John Cary, and Josiah Child did too little to address Grew's key concern of how natural knowledge could be harnessed by the state and applied to productivity and labor. As Hoppit pointed out, this question looked back to the unfinished work of the Royal Society's Georgical Committee in the 1660s.[24] The suggestion that this made Grew a "partial Colbertist, not a mercantilist" is imperfect, because while he did not focus on colonial trade, he did embrace a vigorous vision for state intervention over all kinds of economic life, from trade to production to consumption to the aspects of family formation and sexuality that contributed to the labor supply. Johnson's conclusion that Grew held an "implicit belief in governmental interference" is ideologically loaded in its assumption that all intervention is interference, and underplays Grew's full-throated and explicit advocacy.[25] The existing ideological and disciplinary category that best captures Grew's approach in *The Means* is cameralism, a term not usually applied to England, because he insisted that state power could order the application of existing and potential natural knowledge to the products of the land. Like the German projector-mercantilists Becher and von Schröder (both of whom Grew very likely met in London), Grew was not describing the present state of England but its future potential. Like them, he pitched the nearly utopian pay-off of applying natural knowledge to political goals. Like them, and like other early modern projectors, he drew freely on a range of approaches without being bound by any disciplinary methods.

The scale of Grew's project was England itself, as everyone's labor and consumer choices would be mobilized in the service of a "public" defined exclusively as taxable wealth. A confident and empowered state would dispense knowledge about, and then enforce the application of, improved agricultural, metallurgical, and industrial techniques. An active monarchy would reach into England's localities to ensure that farmers and manufacturers knew and

22 Keller et al., "Projects in the History." For Grew as proto-economist, Johnson, *Predecessors of Adam Smith*.

23 For Petty, Johnson, *Predecessors of Adam Smith*, 138 and Hoppit, *Nehemiah Grew*, xii; for plagiarism and ignorance, Ibid., xli-xlii.

24 Hoppit, *Nehemiah Grew*, xix, xl.

25 Cf. Johnson, *Predecessors of Adam Smith*, 134.

followed practices most beneficial to "the public." Knowledge would flourish, and wasteful trades, unproductive labor, luxurious consumption, and selfish interests would be suppressed in a Utopia of industriousness and efficiency. Beneficial improvement would at last be possible—indeed, *mandatory*—as a powerful regime would disseminate, coordinate, and require improvements that would dissolve any distinctions between its own interests and the public's. Grew requested no reward or role in such processes, positioning himself not as a self-serving projector but as a disinterested counsellor.[26]

Denying the title of projector was one of the projector's favorite themes. Grew illustrates well the claims of this volume's editors that early modern projects were marked by their engagement with situation, violence, and, risk. He stressed that England's relative position was lucky, offering possibilities unavailable to less favored nations. But his approach to situation was dynamic; assessing natural endowments in soils or minerals was a necessary step toward exploiting and transforming them, which in turn would grant England the wealth and power to do still more.[27] Such transformations were presented as non-violent, and indeed the absence of violence is ever-present in *The Means*. Grew says little or nothing about what punishments his scheme would require, perhaps because his frequent discussion of compulsion and power would so obviously depend fundamentally upon force. The only risk, according to Grew, was not that his plan could fail (which England's situation made unlikely), or that it was violent (which was ignored), but that it would not be carried out. Indeed *The Means* is presented as a response to risk: colonies might declare independence, so domestic production must be improved; European kingdoms might embrace these policies, so England must not wait. Problems would be solved, wealth achieved, and greatness enjoyed, "if we please." Neither resources, nor power, nor knowledge was lacking, for Grew, as all were already present and could be mobilized at any time. All that was really needed was the will to power.

Quantification for Improvement

The *Means* aims to quantify, opening with acreage and closing with demography. Throughout these discussions of figures, the concern is with potential, not limits. Grew aimed to overcome poverty and weakness without anticipating Malthus's later concern that such growth was unsustainable.[28] His framing presented improvement as something that must be "computed." (7) He calculated the kingdom's acreage at 46 million, above what Grew's "honoured friend"

26 Cf. the self-interest of English projectors, and German cameralist literature's emphasis on professional status. Keller, *The Interlopers*; Yamamoto, *Taming Capitalism*; Wakefield, *Disordered Police State*.

27 Cf., Keller et al., "Projects in the History," on how situation transcended the boundary between art and nature by furnishing the context for action.

28 McCormick, *Human Empire*; Jonsson and Wennerlind, *Scarcity*; Warde, *Invention of Sustainability*.

William Petty had offered and almost 25% above the correct value.[29] The payoff of this (over)-estimate arrived in Grew's final chapter on the means of increasing population. If Holland offered a model of fully exploited land, then its ratio of 2.4 people per acre showed that England could and should hold 110 million people. Dividing this number in half to "allow room enough for persons of all degrees," left a target population of 55 million, a figure which England and Wales in fact reached only in the twenty-first century. (95) The current population he took to be 12 million people (at least twice the likely figure), which he thought could easily be doubled within a generation of 24 years. (106) Grew's enthusiastic contemplation of available acreage and possible human capital firmly place him within the developing tradition of political arithmetic, especially as practiced by Petty. Hoppit asserts that Grew added nothing to this tradition and indeed achieved only "a standard markedly lower than that of Petty himself, or of King or Davenant" because he was neither rigorous nor creative.[30] But the key goal of Petty's political arithmetic was neither precision nor sophistication, but rather the management and transformation of governable populations, a "transmutation" that treats people like an alchemist treats metals.[31] Grew, like Petty and like other projectors, used numbers instrumentally to justify specific interventions, to show how political power, correctly wielded, could produce better kinds of humans. He avoided debates about calculating national debt obligations, a choice that helpfully avoided the partisan agendas of such literature but even more fundamentally was driven by his own rhetorical purposes: Grew's arithmetic was simple so as to support his claim that the necessary knowledge to improve England already existed and merely required implementation.[32]

Connecting the bare factors of England's resources, its population and land, and the wealth which they might produce, was "improvement."[33] This term as used by Grew might be defined as the application of natural knowledge to land and labor; it was a category of early modern actor describing many of the interventions often critiqued as projects.[34] Both terms were rhetorical, as promoters described as "improvements" what opponents denounced as "projects." For Grew, improvements were desiderata—needed but currently lacking.[35] In his theological work *Cosmologia Sacra* he presented improvement as divine,

29 Hoppit, *Nehemiah Grew*, xxii.

30 Ibid., xxix.

31 McCormick, *William Petty*; McCormick, *Human Empire*, ch. 4.

32 On Grew's politics: Hoppit, *Nehemiah Grew*, xviii, xl; for partisan politics of calculation, Deringer, *Calculated Values*.

33 Slack, *Invention of Improvement*; Fisher, *Enclosure of Knowledge*.

34 As Keller, *The Interlopers*, 173–8 points out, English projects were often called improvements, especially when they violated common rights and thus required state support. But not all improvements were projects, as the term also applied to landlords or even farmers working within existing rights.

35 Cf. Pincus, *1688*, 504, n. 55, which cites *The Means* to support the opposite point. Pincus argued that by the 1680s English roads were good, but Grew in fact stressed that they remained bad twenty years later. For desiderata, Keller, *Knowledge and Public Interest*.

a pervasive process of individual and collective cultivation that furthered and mirrored God's providential care. Echoing the physico-theological work of his fellow members of the Royal Society such as John Ray and Richard Bentley, Grew surveyed creation to find utility everywhere, from the helpful infrequency of earthquakes to the moral lessons offered by evil.[36] Such providence rendered the cultivation of the self and of the commonwealth as connected work, because "man is, by nature, an improvable creature, and capable of a magnanimous, and successful, industry."[37] Grew, like other authors around 1700, could see providence almost everywhere in the natural world and human affairs, an often invisible hand that natural theologians taught believers to perceive.[38]

Remarkably, *The Means* lacks any of this attention to religion or providence. It also diverges from Grew's earlier botanical work, which described a state of ignorance improved somewhat by his own contributions. That work presented itself as part of a new, pioneering expansion of "the territories of knowledge" which would eventually achieve great discoveries.[39] A few decades later, Grew treated such natural knowledge as settled rather than debatable, as already accomplished rather than potential. It only needed to be assembled and dispersed—the kind of work he had done for the Royal Society of London for the Improvement of Natural Knowledge as the curator of its collections—and then at last applied. This vision of improvement was typical of much literature that ignored or rejected the empirical expertise of those who worked the land, assuming instead that all useful knowledge could be—indeed, had been—explained in text and would be imposed from above.[40] *The Means* exuded unruffled confidence that natural philosophy had already determined how best to use land. While earlier projectors often gloried in speculation over hide-bound caution, Grew pretended that no such choice was necessary, because existing natural knowledge was sufficient, practical, and certain.[41] He implied that his own botanical research added to this certainty, but he did not draw on it explicitly or show how knowledge of plant structures and functions added to, confirmed, or developed the empirical observations of mid-seventeenth-century improvers. Instead, he silently abandoned the Baconian rhetoric of potential in favor of the projector's assertion that necessary knowledge existed and simply awaited implementation.

36 Blair and von Greyerz, *Physico-Theology*; Grew, *Cosmologia Sacra*, 92–105.
37 Grew, *Cosmologia Sacra*, 103–4.
38 Walsham, *Providence in Early Modern*; Sheehan and Wahrman, *Invisible Hands*, ch. 1.
39 Grew, *Anatomy of Plants*, unpaginated preface.
40 Fisher, *Enclosure of Knowledge*.
41 Keller, *The Interlopers*.

If We Please: Reforms of Land and Labor

The first controversial topic that Grew treated as settled was enclosure. It was, he asserted, obviously lawful and beneficial, the reason for England's escape from famine. Its critics were ignorant, and the general good required that "all bad land should be made better," and the residents of bad land made to work. (18) The land's nature was connected to labor productivity and property regimes, as the poor who freeloaded upon commons were idle, the lands overgrazed, and their animals wasted by the endemic "rot" of "boggy lands." Neither woods nor grain could mature, and unprotected open fields were damaged by "bleak winds." Grew calculated that enclosure and improvement would multiply productivity as much as forty times. Like other contemporary enemies of the commons, Grew stressed that social ills such as poverty, idleness, thievery, and immorality were inevitable products of failing to improve.[42] Wrong land made wrong living, and, in turn, bad people made bad nature, as "the worst of people" would "destroy" the potential of young plants. (18–19) After enclosure, however, "the culture of lands will naturally follow." Nature, however, needed expertise, so Grew summarized how plowing, draining, watering, and manuring would achieve booming productivity with certainty and without risk. Draining, he asserted, improved land values by up to twenty times, though his only evidence was a single case lifted without attribution from Blith's *English Improver Improved*, published over 50 years earlier.[43] Some new crops, he claimed, could be grown nationally rather than merely regionally, such as saffron, which would yield an impressive profit almost everywhere. (25) Such improvement was possible because its methods were already known; nothing would prevent dramatic growth once landholders were persuaded, or forced, to listen to experts (such as him).

It would be a mistake to read this position as the proto-physiocratic principle that land was the only true basis for wealth. While Pincus has argued that late-seventeenth-century political economists debated the choice between land *or* labor, Grew stressed how productive land was desirable *both* because of the wealth it brought its holders *and* for its contributions to manufacturing and oversees trade.[44] His discussion of "the Advantages we have, and may have, for improvements by sea" distinguishes natural from political advantages analytically, only to insist on their interconnection. England's naturally benevolent winds, abundant harbors, and fortunate situation "against the middle of Europe" needed to be developed by wise policy. (59) Renewed cultivation of timber, for example, could allow England to reclaim supremacy over the Dutch in shipping. (61) As with wood, so with husbandry: the essence of improvement was recognizing what could best grow on existing land, and then

42 Fisher, *Enclosure of Knowledge*.
43 Blith, *English Improver Improved*, 86.
44 Pincus, "Rethinking Mercantilism."

deploying capital and labor appropriately. "Natural advantages" mattered, but also needed Dutch-style "prudence." The Dutch, however, could never imitate England's resource advantages, while "the prudential ones which they have, we may also have if we please." (65) This emphasis on the will, on power as activated primarily by desire, was the language of central European cameralists, especially those in London around 1680, precisely when Grew was most active in the Royal Society.[45]

Improved land would allow England to export food, "to supply the granaries of the Dutch." (62) Similarly, coastal fisheries could be reclaimed from the Dutch, if the "want of skill, and want of people" were remedied by instruction and a new focus on increasing population—"a sufficient number of hands" for trade and manufacture. (77) Demographic and agrarian improvement would form a virtuous circle: previously underemployed labor would fuel growing industry *and* husbandry—"mines, farms, and manufactury"—freeing up capital that would otherwise be spent supporting paupers. (78) Domestic production of raw materials would employ workers and aid improved husbandry; improved pastures, for example, would supply better wool for a thriving domestic textile industry. (31) Grew would have agreed with Josiah Child that the essence of political economy was the relationship, not the choice, between land and labor. Productive land required not only the gifts of nature but also skillful work: "land cannot yield its utmost increase, but through men's labour and pains."[46]

Grew persistently stressed how land and labor could be efficiently exploited to create surpluses and increase exports. Improving roads and digging canals, for example, saved money, time, and tens of thousands of horses for export. (14, 16) Surveying minerals would show that coal could supply the entire nation, freeing "a vast deal of wood for better uses," including shipping. (11) The existing division of labor should be replaced by vertical integration, replacing the "masters pay" of excessive middlemen with mere "servants pay" for poor laborers. This would lower prices and increase exports. (49–50) So would expanded labor supply. The unproductive and unmarried—scholars, schoolmasters, lawyers, imprisoned debtors, parish poor, tavern-keepers, and all petty merchants—should become industrious. (77–106) Illness was especially inefficient, worse than death, because "a sickly man, while his own labor is lost also lives upon the labors of another." (100–1) As self-sufficiency, industriousness, and labor all increased, and demand for imported "luxuries" declined, the balance of trade would improve. Resulting profits would be invested in indus-

45 Especially von Hörnigk *Austria Supreme*, whose German subtitle "wenn es nur will" evokes Grew's "if we please." This work remained untranslated, but Grew had connections to German cameralists von Schröder and Hörnigk's brother-in-law Becher. Keller, "Happiness and Projects;" Smith, *Business of Alchemy*, ch. 2.

46 Child, *Discourse of Nature*, 26. Cf. Pincus, "Rethinking Mercantilism," 18.

try and unimproved wasteland, improving both. (68) Thus exports were the ends, the means, and the measure of a prosperous, industrious, fully employed kingdom.

The Royal Supremacy of the English Economy

To achieve such efficiencies, Grew advocated a new relationship between knowledge and power. First, knowledge of the natural basis for improvement should be dispersed through new research and a new network of local institutions. Just as "in the Conqueror's Time there was a survey of all lands in England," now "skillful miners and alchymists" should survey "our subterranean treasures." (12) This Domesday Book for mines would be accompanied by a registry of "every place" and their particular minerals, including their "situation, quantity, and depth," with copies in every county and with accompanying samples of the soils and minerals described in the survey. Thus the first stage of improvement was a national system of natural history museums, synthesizing text and exemplary collections of England's mineral resources. These local natural historical collections would also be created for husbandry, containing descriptions, instruments, and materials. (29) These would be available to consult, but their meanings would also be expounded by a master, "who with the help of this book and his own practical skill, may teach the youth of the hundred, instead of grammar learning, the art of planting and all other parts of good husbandry, both by discourse and examples." While the museums and surveys of minerals would be in every county, husbandry schools would be placed in every *hundred*, of which England contained something like 900.[47] A network of professional agricultural experts would complement a network of museums of minerals and farming implements—at a time when there was no institutional teaching of such subjects anywhere in the kingdom, and when even grammar schools lacked central oversight, organization, or funding.

Industrial trades needed similar cultivation, so Grew argued that there should also be similar repositories in every county of "all the manufactures already made, here or elsewhere" with models of all "materials, engines, and tools" plus "all the sorts of armor and instruments of war" in the Tower of London. (51) Every county, then, would boast a museum of science and industry, with complete collections of all local minerals, farming tools and methods, built models, and printed patterns of all existing industrial techniques. Like those natural philosophers and alchemists who called for a marriage of theory and practice, Grew wanted all useful knowledge to be organized, visible, and accessible.[48] But he was silent about whether there were any problems with such circulation and publicity. Instead, he focused on how

47 Webb and Webb, *English Local Government*, 285.
48 Cf. Smith, *Business of Alchemy*.

authoritative collections would further expand knowledge. Mineral surveys would inspire "any landlord or freehold" to inspect their own holdings, while the collection would allow "any gentleman philosophically given" to conduct further research. (12) The displays of inventions would similarly inspire new discoveries or improvements. And though some inventions "may be stolen by foreigners," this was irrelevant, because knowledge would continually develop and disperse in the kind of "great instauration" that so excited the first generation of English Baconians.[49] A little theft of intellectual property was irrelevant when compared to boundless horizons of creativity. The "varieties of matter and motion" and "humane wit in the managing hereof" were both limitless, so "there will be inventions new and infinite to the end of the world." (51–52). County collections of minerals, husbandry, and manufactures would not be mere museums, but centers of open-ended research and development.

Second, in addition to new institutions, Grew advocated for new policies mandating a vast range of behaviors relevant to land management, trade, labor supply, industriousness, and exports. If *The Means* ignores the emphasis on divine providence of Grew's *Cosmologia Sacra*, it also diverged from that treatise's vision of good rule. William III, fawned Grew, came in 1688 to protect life, liberty, property, and Protestantism.[50] But in *The Means*, William's successor Anne is addressed not as a safeguard against absolutism but as a royal alchemist who should transform land and labor, transgressing liberties at will. Subjects' lives should be actively managed, with marriage, procreation, work, and most things connected with leisure organized by the state for the benefit of "the public."

The museums of improvement in every county, and the schools of husbandry in every hundred, would not only serve to inspire but also to compel. Grew's proposals for such collections only implied state support, but he was much more explicit in how state power would impose the application of new knowledge, desiring that "Your Majesty's people, being by this means instructed, be obliged to use their skill." (29) Every lease should state which "proper wood and fruit" the holder must plant, with copies deposited with the collections of books, samples, and implements. This land registry would provide the working archive of a new royal officer, modeled on existing state oversight of medicine, "some manufactures," and roads. This "Surveyor of the Husbandry" would "observe any neglect of the laws thereunto relating, and yearly to give an account hereof to your Majesty's Commissioners." (30) These hundreds of new officers, acting from within the natural historical collections, would ensure that local practices conformed to the highest standards as dictated by central experts and as codified in leases. Unlike the officers within England's existing "parish state" who answered primarily to their neighbors—fellow middling men who chose and funded them—the new surveyors

49 Webster, *Great Instaura*tion.
50 Grew, *Cosmologia Sacra*, preface.

would report to the center.[51] Grew's local museum-collection-archive-schools would not only dispense information; they would house Improvement Intendants. (29–30)

The state would organize trade with an equally strong hand, though without the institutional basis of local improvement officers. Grew imagined few limits to the state's power to direct labor, envisioning interventions everywhere. These served a familiar economic ideology—a positive balance of trade, decreased imports, and increased exports—so their novelty is the coordination of means rather than ends. Grew wanted wholesale management of shipping, including timber, construction, maintenance, and water desalination. All companies must serve the state by either exporting finished goods more valuable than their imports or re-exporting foreign products. Customs officers would set prices on *any* imports that were useful for domestic manufacturing. Because, Grew reasoned, magistrates could set bread prices, any other form of "necessity" similarly justified the elimination (or permanent suspension) of freedom of trade, elevating trade policy to the status of a permanent state of emergency. (69) Abroad, new trades could expand into any territory not already claimed by an existing company, but plantations (including Ireland) could only buy from England. (70) All traders must export manufactures rather than bullion, and their imports were subject to price controls. Against such interventions, Grew stressed how "easy" commerce would become from a strong governmental hand. A "sufficient convoy" for foreign trade, lowered seamen's wages, more efficient merchant courts, eliminated import duties, and, above all, lowered interest rates, would all be boons rather than burdens to traders. (72) Lower interest rates would increase domestic investments, invigorate overseas trade, and make "the stock of manufactures" grow, and thereby exports increase. All of this could be obtained by Acts of Parliament, which, he assumed, could manipulate interest rates at will.

England's human capital was similarly subject to legislation, transmuting all idle, selfish, or inefficient subjects into industrious workers. Here state intervention would be even more pervasive and multifaceted. Pro-natalist policies would encourage marriage and punish celibacy in a range of ways. For the poor, Parliament would establish and manage a stock to provide dowries, allowing women to marry earlier and have more children. For the rich, fathers would be required to provide for daughters, allowing all to marry by age 25. Mandatory celibacy for university fellows would be ended (as well as cutting their number and expanding the teaching duties of those who remained). Laws wielded sticks against celibacy and dangled carrots for parenthood by raising taxes on bachelors, exempting married men from "burdensome offices," and bestowing marks of distinction on fathers. Having or even treating syphilis would be punished, and marriage—or at least child support—made mandatory for any man "who shall lie with a maid." (95–99) Immigration was to

51 Braddick, *State Formation*.

be encouraged, especially for skilled workers such as "husbandmen, artificers, and merchants." Xenophobia was brushed away, as foreigners who followed "our law and customs, after one or two generations, are Englishmen as much as any." They were to be offered rent-free wastelands, free trade, and naturalization, and indulged by "liberty of religion." This, remarkably, is the only mention of religion in *The Means*, a minor part of its pro-immigration argument, which itself is subordinate to pro-natalist policies. Emigration should also be restricted. Colonial populations were sufficient, with "their blacks" providing enough population growth to allow for the trade that "we" in England have "with them" in the colonies. "Transporting" too many desirable workers to colonies, or allowing Catholic families to send daughters abroad to be nuns, also deprived the kingdom of valuable demographic assets. (99–100)

Finally, social disciplining and public health would prolong life, suppress disease, and control work. Labor would be mandatory for the poor, and all practices or institutions that promoted idleness in any class would be banned. Grew considered as undesirable: all gambling, hunting dogs for anyone below the peerage, almost all theater, most educational travel, dancing schools, most taverns, coffeehouses, alehouses, most petty merchants, all pawnbrokers, stockbrokers, quacks, and fortune-tellers—all of these and more would be prohibited. (80–83) In fact almost all middlemen and merchants, "by some means or other, should be suppressed," and manufactures sold directly to customers. "All mere selling trades should be limited to a small number," especially those such as linen drapers who drove the "monstrous" imports from India and those such as vintners who increased "debauchery." (85) The number of grammar school masters would be reduced dramatically because "we are overstocked with idle and unprofitable people called scholars," (86) and the number of lawyers greatly reduced in conjunction with a streamlined judicial process. (87–89) In sum, all "mischievous" trades "may be directly prohibited by statute," and those which are "unprofitably numerous" would be "limited more indirectly." (84–85) The moral and the economic benefits of such policies were indistinguishable, as men would be blocked from "an useless and destructive course of life" full of "vain and transient pleasure," instead "employing their heads and purses" in "husbandry, manufacture, or merchandize." (80)

Health care, in particular, required attention because it impacted population. Apothecaries would be "stinted" so as to allow each to have a larger share of business and thereby greater expertise. Lowered medical fees would raise demand and expand access by the "middle sort" to care and also give new physicians greater experience and better on-the-job training. Almshouses would be converted into hospitals for the sick poor to redress the alarming depopulation suggested by the latest Bills of Mortality. Hospitals would be visited regularly by physicians and surgeons who were "obliged" to attend to the poor and to allow students to attend. "By which means, the hospitals will be excellent schools for all the junior physicians in England, and Your

Majesty's people, both rich and poor, will have more effectual care taken of them." A panel of medical experts would craft a book of advice for nurses to remedy their "ignorance," by which they would be better trained to care for children and be encouraged "to call for advice." (102–104) As in his use of botanical knowledge for improved husbandry, Grew here treats a field that he, a university-trained and practicing physician, knew was rife with contestation and newly emergent knowledge claims, as if it were settled and certain. Physicians were imagined to be experts who could agree, and whose knowledge would easily be synthesized and disseminated to the ignorant. Expanded medical training and increased access to expert care would then reduce wasted productive labor.

In its nearly boundless ambitions to manage social and economic life, *The Means* transcends some distinctions that historians often apply to economic debates in the period. Economic historians assert that resources, power, or knowledge was paramount, but Grew stressed their interplay. Instead of debating whether land or labor was the true basis of wealth, Grew wanted the state to control both in mutually reinforcing ways. Hoppit suggests that Grew was a "partial Colbertist not a mercantilist" because he did not seek imperial expansion and did not stress the fiscal-military state. (xl) But Grew combined the expansive vision of state power associated with both Colbert and German cameralism with typically "mercantilist" goals such as the economic subservience of colonies and investment in naval power. (94) The state would manage but not replace private interest, mandating private virtues to bring public benefits. Grew's network of office holders, empowered by the center to dispense natural and technical knowledge and to mandate its acceptance, has no educational precedent but was structurally comparable to one very familiar national institution: the Church. Compared with existing early modern approaches to education, collections of natural histories, and state support for science, all of which were modest, *The Means* is shockingly ambitious and invasive. But it does compare with the place of religious knowledge in public life, as Grew advocated a secular version of the Church's network of parochial instruction, authorized texts, and compulsory acceptance of orthodoxy. Grew, the son of a clergyman deprived of his living for dissent, advocated a kind of Royal Supremacy over the economy.[52]

People or The Public: England as Project

This vision of royal power adds weight to arguments that early modern political culture was characterized by expansive visions of the role of a state no longer restricted to pursuing mere stability, and not yet limited by claims that

52 Hunter, *Grew, Nehemiah*.

human societies obeyed their own autonomous and natural laws.[53] For Grew, only policy, not submission to Providence, advanced the national interest. There were no self-directing mechanisms or laws of history to drive England forward: "Some may say, 'What need of all this ado? Things will mend themselves.' I answer that nothing in the world was ever amended, but by means or a miracle: the latter of which, I suppose no one is so vain as to expect." (106) Agency was located in a state that could direct human energies in any direction. The society that such power would create (with its highly circumscribed individual autonomy) shares much with the utopian tradition of More and Bacon, and like so much of that tradition can appear disturbingly dystopian to modern readers. Liberal values based on individual choice are ignored in favor of state influence over marriage, child rearing, education, and work. It was not an explicitly religious vision; besides a vague opposition to luxury and sin, there is no reference to doctrine or ecclesiology. Grew envisioned a kind of Industrious Revolution from above, in which work and production were subordinated to "the public."[54]

This "public" was not the people (whether as a collection of autonomous individuals or as a metaphorically united body politic), but rather those aspects of social life that allowed the state to extract money. In discussing taverns and alehouses, for example, Grew asserts that they tempt and debauch "Your Majesty's subjects" in general, and "all sorts of working people" in particular. "People" can be grouped according to qualities such as wealth or status, and all such groups within the kingdom collectively constitute the monarch's subjects. When this large group of "people" waste time drinking, "as far as the value of their labor goes, is so far a public loss." (82) The people are not the "public," but the value of their labor is. Similarly, analyses of merchants, manufacturing, and husbandry all consider "the public" as wealth for the state to tap, with emphasis on increased productivity and fiscal utility rather than the condition of the people. This quantifiable and taxable "public" was a forerunner, perhaps an ancestor, of the twentieth-century construct "the economy."

The "public" measured the people's collective happiness, so Grew presented heavy-handed interventions and mandates as benevolent, good government. This provided the state with a more solid basis than risky imperial schemes, because colonies might one day resent their subjection and revolt. "It is not impossible," he supposed, that the "West Indies" (apparently the only colonists worth considering) might become "strong and politic, forgetting their relation to their mother-countries, will then confederate" and seek independence. (107) But even in such a post-imperial future, England "may be masters still" of "our mines and our husbandry," and with prudence, "your Majesty may become, in a short time, the Queen of Paradise and the Ocean." (108) Accomplishing such glorious prosperity entailed new laws to direct work

53 McCormick, *Human Empire*.
54 Cf. De Vries, *Industrious Revolution*.

and production—laws which would make the English a "happy, because a free people. But," he immediately stressed, "this is always to be meant as free according to law, so the law to aim at the public good." (22) Nothing, for this member of the Royal Society, would make English people happier than following laws that made their government rich.

Grew's *The Means* dizzyingly combines wildly utopian schemes with commonplace goals of much early modern political economy. It was derivative of improvement literature in the Baconian tradition, and yet radical in its call for direct state management of expertise, life, liberty, and property. Its scheme for a national improvement police, based in local natural history museums that doubled as state schools for agriculture and mechanics, was of course not realized. Other aspects of Grew's project had been or became central to English policy, such as the subordination of colonial economies or the treatment of the poor as manageable sources of labor rather than as rights-bearing subjects, fellow Christians, or equal members of the body politic. But the interest of *The Means* does not rely on how many of its suggestions were implemented and how many were impractical. Rather, it is a helpful window into early modern understandings of the relationships between power, knowledge, and the natural environment, because it advocates so openly for compulsion and the collapsing of the individual into the collective. If liberalism would typically frame such policies as, in Johnson's terms, "governmental interference," Grew shows how a "public" was understood by one who rejected any sphere for economic behavior autonomous from governance and policy.[55] If all trade and work were subject to, and demanded management by, a state, then it was only logical to coordinate work according to expert knowledge about nature.

Grew's proposal was entirely typical of early modern projects despite—or perhaps because of—how hard it worked to hide its place in that tradition. Projects, as this volume's introduction explains, often focused on specific situations and targeted marginalized populations. Grew treated *all* of England as a wasteland subject to intervention and management, ignoring differences in geography, climate, or fertility because everywhere was characterized by untapped potential. Similarly, he did not reserve his disciplinary gaze for the enslaved or the idle poor, but rather saw *every* English subject—from the "greatest ladies" downwards—as needing to become more productive and less wasteful. He studiously ignored risk and uncertainty, treating natural knowledge and wise political economy as available, settled, and reliable, whose dictates ensured success; the only risk was inaction. He drew on, and indeed lifted quite liberally from, contemporary political economists, but his refusal to engage them directly allowed him to ignore their expertise and to avoid being bound by their emergent discipline. He deployed the same lateral thinking, connections between heterogeneous topics, and assumption that existing small initiatives could be easily scaled up, that characterized a century of

55 Johnson, *Predecessors of Adam Smith*, 134.

English projecting, but his silent appropriation of their techniques and ideas obscured that genealogy.[56] Like other projectors, he presented himself not as a natural philosopher standing on the shoulders of giants but as a polymath with universal competency. In *The Means* the agency was collective, a national "we" entrusting the oversight of wise policy to the Queen and the enactment of needed legislation to Parliament, with no need to consider faction, party, or resistance. Violence was also ignored, though its presence is everywhere implied by passive constructions describing what was to be allowed or prohibited. Grew's own status as projector was masked by his silence about any rewards, interests, or benefits that his proposals would attract. In such ways, Grew offered a project that sought to escape its own genre and looked forward to the purportedly universal and disinterested knowledge of Enlightenment political economy.

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Bibliography

Allen, Robert C. *The British Industrial Revolution in Global Perspective*. Cambridge University Press, 2009. https://doi.org/10.1017/CBO9780511816680.

Ashworth, William J. *The Industrial Revolution: The State, Knowledge and Global Trade*. Bloomsbury, 2017.

Barth, Jonathan. "Reconstructing Mercantilism: Consensus and Conflict in British Imperial Economy in the Seventeenth and Eighteenth Centuries" *William and Mary Quarterly* 73, no. 2 (2016), 257–90. https://doi.org/10.5309/willmaryquar.73.2.0257.

Berg, Maxine. *Luxury and Pleasure in Eighteenth Century Britain*. Oxford University Press, 2005. https://doi.org/10.1093/acprof:oso/9780199215287.001.0001.

———, and Pat Hudson. *Slavery, Capitalism, and the Industrial Revolution*. Polity, 2023.

Blair, Ann, and Kaspar von Greyerz, eds., *Physico-Theology: Religion and Science in Europe, 1650–1750*. Johns Hopkins University Press, 2020. https://doi.org/10.1353/book.76884.

Blith, Walter. *The English Improver Improved or the Survey of Husbandry Surveyed*. London: John Wright, 1653.

Braddick, Michael J. *State Formation in Early Modern England c. 1550–1700*. Cambridge University Press, 2000. https://doi.org/10.1017/cbo9780511612527.

56 Cf. Keller, *The Interlopers*.

Cavert, William M. *The Smoke of London: Energy and Environment in the Early Modern City*. Cambridge University Press, 2016. https://doi.org/10.1017/cbo9781139680967.

Child, Josiah. *A Discourse of the Nature, Use and Advantages of Trade*. London: Randal Taylor, 1694. Wing 2nd ed. C3855.

Deringer, William. *Calculated Values: Finance, Politics, and the Quantitative Age*. Harvard University Press, 2018. https://doi.org/10.4159/9780674985995.

De Vries, Jan. *The Industrious Revolution: Consumer Behavior and the Household Economy, 1650 to the Present*. Cambridge University Press, 2008. https://doi.org/10.1017/cbo9780511818196.

Fisher, James D. *The Enclosure of Knowledge: Books, Power, and Agrarian Capitalism in Britain, 1660–1800*. Cambridge University Press, 2022. https://doi.org/10.1017/9781009049283.

Grafe, Regina. *Distant Tyranny: Markets, Power, and Backwardness in Spain, 1650–1800*. Princeton University Press, 2012. https://doi.org/10.23943/princeton/9780691144849.001.0001.

———. *The Anatomy of Plants with an Idea of a Philosophical History of Plants, and Several Other Lectures, Read Before the Royal Society*. London: W. Rawlins,1682. Wing G1945.

———. *Cosmologia Sacra: Or a Discourse of the Universe As It Is the Creature and Kingdom of GOD*. London: W. Rogers, 1701.

Hoppit, Julian, ed. *Nehemiah Grew and England's Economic Development: The Means of a Most Ample Increase of the Wealth and Strength of England 1706–7*. Records of Social and Economic History, New Series 47. British Academy, 2012. https://doi.org/10.1093/actrade/9780197264959.book.1.

Von Hörnigk, Philipp Wilhelm. *Austria Supreme (if it so wishes) (1684) A Tract for European Economic Supremacy*. Edited by Phillipp Robinson Roessner. Translated by Keith Tribe. Anthem Press, 2018. https://doi.org/10.2307/j.ctv2bctcb.

Hunter, Michael. "Grew, Nehemiah (bap. 1641, d. 1712): Botanist and Physician." In *Oxford Dictionary of National Biography*. Oxford University Press. https://doi.org/10.1093/ref:odnb/11521. Accessed April 1, 2024

Jacob, Margaret C. *The First Knowledge Economy: Human Capital and the European Economy, 1750–1850*. Cambridge University Press, 2014. https://doi.org/10.1017/cbo9781107358355.

Johnson, E. A. J., *Predecessors of Adam Smith: The Growth of British Economic Thought*. Augustus Kelly, 1965. Reprint of 1937 edition.

Jonsson, Fredrik Albritton. "The Industrial Revolution in the Anthropocene." *Journal of Modern History* 83, no. 3 (2012), 679–96. https://doi.org/10.1086/666049.

———, and Carl Wennerlind. *Scarcity: A History from the Origins of Capitalism to the Climate Crisis*. Harvard University Press, 2023. https://doi.org/10.2307/jj.890690.

Keller, Vera. *Knowledge and the Public Interest, 1575–1725*. Cambridge University Press, 2015. https://doi.org/10.1017/cbo9781316273227.

———. *The Interlopers: Early Stuart Projects and the Undisciplining of Knowledge*. Johns Hopkins University Press, 2023. https://doi.org/10.56021/9781421445939.

———. "Happiness and Projects Between London and Vienna: Wilhelm von Schröder on the London Weavers' Riot of 1675, Workhouses, and Technological Unemployment." *History of Political Economy* 53, no. 3 (2021): 407–23. https://doi.org/10.1215/00182702-8993288.

———, Ted McCormick, and Kelly Whitmer, "Projects in the History of Knowledge: An Introduction." Journal for the History of Knowledge 6 (forthcoming). https://doi.org/10.55283/jhk.21237.

Magnusson, Lars, "Cameralism as *Sonderweg* of German Mercantilism?" *History of Political Economy* 53, no. 3 (2021): 389–405. https://doi.org/10.1215/00182702-8993274.

McCloskey, Deirdre N. *Bourgeois Dignity: Why Economics Can't Explain the Modern World*. University of Chicago Press, 2010. https://doi.org/10.7208/chicago/9780226556666.001.0001.

McCormick, Ted. *William Petty and the Ambitions of Political Arithmetic*. Oxford University Press, 2009. https://doi.org/10.1093/acprof:oso/9780199547890.001.0001.

———. *Human Empire: Mobility and Demographic Thought in the British Atlantic World, 1500–1800*. Cambridge University Press, 2022. https://doi.org/10.1017/9781009128834.

Mokyr, Joel. *The Enlightened Economy: An Economic History of Britain 1700–1850*. Yale University Press, 2009.

Parthasarathi, Prasannan. *Why Europe Grew Rich and Asia Did Not: Global Economic Divergence, 1600–1850*. Cambridge University Press, 2011. https://doi.org/10.1017/cbo9780511993398.

Pincus, Steve. *1688: The First Modern Revolution*. Yale University Press, 2009. https://doi.org/10.12987/9780300156058".

———. "Rethinking Mercantilism: Political Economy, the British Empire, and the Atlantic World in the Seventeenth and Eighteenth Centuries." *William and Mary Quarterly*, 69, no. 1 (2012): 3–34. https://doi.org/10.5309/willmaryquar.69.1.0003.

Pomeranz, Kenneth. *The Great Divergence: China, Europe, and the Making of the Modern World Economy*. Princeton University Press, 2000. https://doi.org/10.2307/j.ctt7sv80.

Riello, Giorgio. *Cotton: The Fabric that Made the Modern World*. Cambridge University Press, 2013. https://doi.org/10.1017/cbo9780511706097.

Rössner, Philipp Robinson. "Introduction: Cameralism, Capitalism, and the Making of the Modern Economic Mind." *History of Political Economy* 53, no. 3 (2021): 371–87. https://doi.org/10.1215/00182702-8993260.

Roos, Anna Marie. "The Doctoral Dissertation of Nehemiah Grew (1641–1712): The Nervous Fluids and Iatrochymistry in Context." In *Collected Wisdom of the Early Modern Scholar: Essays in Honor of Mordechai Feingold*, edited by Anna Marie Roos

and Gideon Manning. Springer, 2023. https://doi.org/10.1007/978-3-031-09722-5_15.

Satia, Priya. *Empire of Guns: The Violent Making of the Industrial Revolution*. Stanford University Press, 2018. https://doi.org/10.1515/9781503610828.

Sheehan, Jonathan and Dror Wahrman. *Invisible Hands: Self-Organization and the Eighteenth Century*. University of Chicago Press, 2015. https://doi.org/10.7208/chicago/9780226233741.001.0001.

Slack, Paul. *The Invention of Improvement: Information and Material Progress in Seventeenth-Century England*. Oxford University Press, 2014. https://doi.org/10.1093/acprof:oso/9780199645916.001.0001.

Smith, Pamela H. *The Business of Alchemy: Science and Culture in the Holy Roman Empire*. Rev. ed. Princeton University Press, 2016. https://doi.org/10.1515/9781400883578.

Stern, Philip J. and Carl Wennerlind, eds. *Mercantilism Reimagined. Political Economy in Early Modern Britain and Its Empire*. Oxford University Press, 2013. https://doi.org/10.1093/acprof:oso/9780199988532.001.0001.

Wakefield, Andre. *The Disordered Police State: German Cameralism as Science and Practice*. University of Chicago Press, 2009. https://doi.org/10.7208/chicago/9780226870229.001.0001.

Walsham, Alexandra. *Providence in Early Modern England*. Oxford University Press, 1999. "https://doi.org/10.1093/acprof:oso/9780198208877.001.0001.

Warde, Paul. *The Invention of Sustainability: Nature and Destiny, c. 1500–1870*. Cambridge University Press, 2018. https://doi.org/10.1017/9781316584767.

———. "A Modern Energy Regime." In *Power to the People: Energy in Europe over the Last Five Centuries*, edited by Astrid Kander, Paolo Malanima, and Paul Warde. Princeton University Press, 2013. https://doi.org/10.1515/9781400848881-006.

Webb, Sidney and Beatrice Webb. *English Local Government from the Revolution to the Municipal Corporations Act: The Parish and the County*. Longmans, 1906.

Webster, Charles. *The Great Instauration: Science, Medicine and Reform 1626–1660*. Holmes & Meier, 1975.

Wrigley, E. A. *The Path to Sustained Growth: England's Transition from an Organic Economy to an Industrial Revolution*. Cambridge University Press, 2016. https://doi.org/10.1017/cbo9781316488256.

Yamamoto, Koji. *Taming Capitalism Before its Triumph: Public Service, Distrust, and 'Projecting' in Early Modern England*. Oxford University Press, 2018. https://doi.org/10.1093/oso/9780198739173.001.0001.