PART I

INTRODUCTION

1

Collecting the Future in the Early Modern Past

KNOWLEDGE KNOWS NO BOUNDS

Today's concept of the advancement of knowledge rests on an early modern political idea: the advancement of empire. If the Renaissance entailed a reimagining of the ancient world, the advancement of empire projected a future one. Formulated by Francis Bacon in the form of a collaborative wish list entitled "New World of Sciences or Desiderata," this advancement represented knowledge as territory. The horizon of possibility stretched beyond where the eye could see, as humans aimed at new and wonderful landmarks: stronger, younger, and healthier people, brighter colors, unbreakable and incombustible materials, unlimited sources of power, ever-burning lamps, lavish fragrances, instant communication, universal language, airships, and submarines.

The wish lists of centuries ago uncover old concerns, fears, desires, conceptions of the present, and ideas about the future. While they tell us much about the past, they also reveal much about ourselves. This is not because wish lists can sometimes be read as precocious prophecies of our future, as has been one list found in the papers of Robert Boyle, which detailed such desirables as "The Recovery of Youth, or at least some of ye Markes of it as new Teeth, new Hair color'd as in Youth" and "Freedom from Necessity of much Sleeping exemplified by the Opera[ti]ons of Tea and w[ha]t happens in Mad-Men."[1] Rather,

[1] Ian Sample, "Robert Boyle: Wishlist of a Restoration Visionary," *The Guardian*, www.guardian.co.uk, June 3, 2010. Royal Society Boyle Papers, vol. 8, 207v-208v. Available online at http://www.bbk.ac.uk/Boyle/boyle_papers/bp08_docs/bp08_207v-208r.htm. Consulted July 29, 2008. Boyle repeated this list in vol. 36, fol. 77v-78r in the 1670s–1680s. This volume contains material composed circa 1658 for the second volume of *Usefulness*, published in 1671. Robert Boyle, "Usefulness of Natural Philosophy, II, 2," in *The Works of Robert Boyle*, Michael Hunter, ed. (London: Pickering & Chatto, 2000), vol. 6, p. liv. Michael Hunter, *The Boyle Papers: Understanding the Manuscripts of Robert Boyle* (Aldershot: Ashgate, 2007), 451. Vera Keller, "The 'New World of Sciences': The Temporality of the Research Agenda and the Unending Ambitions of Science" (Focus Section), *Isis* 103:4 (2012), 727–734.

wish lists tell us about ourselves because they established a new intellectual economy relating to the public and in which scholars still participate today. Wish lists stand at the root of an idea that has become a truism: that the advancement of knowledge serves the public interest. This idea of service to the public interest is one often invoked but rarely critically examined. In exploring how the wish list reconceptualized learning in the form of shared desires, we can also analyze the intellectual economy linking scholars to one another and to the public interest in new ways.

The wish list helped reformulate what could count as scholarly work. To participate as a scholar in the discovery of a *desideratum* meant not composing a pansophic collection of all knowledge or even a complete survey of any single topic. Rather, it meant publishing what many early modern authors had been loathe to publish: unfinished works, initial essays, and incomplete attempts at much larger problems. A shared wish list shifted the body of knowledge from what was already known to what was no longer or not yet known. Conceptualizing a desired piece of knowledge as one among many in a catalog of *desiderata* implied a cohort of researchers advancing through time closer toward a host of desired objects. The multiplicity of both subjects and objects of *desiderata* placed individual inquiries within a much larger chronological and social framework. As an ever-advancing frontier, the wish list maintained scholarly targets in a long-term state of the not-yet-discovered. Such *desiderata* surpassed the abilities and lifetimes of individuals, and thus could and had to be spread through time and between individual researchers. Bacon's *desiderata* remained in a pulverized form, allowing individuals to contribute their grain of sand to the gradual "supplying" of the *desideratum*.

Recasting knowledge as the aggregate of human desires was part and parcel of a larger intellectual and social shift reformulating an ancient notion of an organic body politic into a public held together by shared interests.[2] *Desiderata* were purportedly those questions in which all of society had an interest. Thus, the linking of scholars together in the collaborative fulfillment of a *desideratum* also linked scholarly activity to the public. Such techniques for collaboration inspired confidence in the advancement of knowledge neither because scholars were deemed disinterested nor because self-interest has been rendered unproblematic. The vices of the learned were a perennially popular academic theme, and individual scholars did not encourage confidence.[3] Artificial systems for linking the private interests of scholars to one another and to the public did. At a time when the strategic contrivances of written constitutions first emerged

[2] Winfried Schulze, *Vom Gemeinnutz zum Eigennutz: Über den Normenwandel in der ständischen Gesellschaft der Frühen Neuzeit* (Munich: Historisches Kolleg, 1987). Wolf-Hagen Krauth, "Gemeinwohl als Interesse. Die Konstruktion einer territorialen Ökonomie am Beginn der Neuzeit," in *Gemeinwohl und Gemeinsinn. Historische Semantiken politischer Leitbegriffe*, Herfried Münkler and Harald Bluhm, eds. (Berlin: Akademie, 2001).

[3] Sari Kivisto, *The Vices of Learning: Morality and Knowledge at Early Modern Universities* (Leiden: Brill, 2014).

for the body politic, the wish list offered such a contrivance for sustaining the body scientific.

This was the great reshaping effected by the wish list and in which we still participate. Rare is the scholar today who sets out to write a complete study of any field aimed at other scholars. The structure of learning now is that of intercalated individual attempts, through which we strive to fulfill *desiderata* and advance research in tandem. Academics today do not think about the importance of *desiderata* to the ways they conceptualize what they do only because *desiderata* are so central to what they do. They are so much a part of the way research has been conceptualized in the past few centuries that they no longer attract a second thought. They do deserve attention, however, and not only for the substantial light they can shed on early modern notions of useful knowledge. They also deserve attention since many recent defenses of learning in general and the humanities in particular refer to the equation between the advancement of learning and the public interest. A critical history of this seventeenth-century equation is long overdue.

BODIES NATURAL, POLITICAL, AND SCIENTIFIC

The transformation in social mores via new concepts of interest is of course linked to much broader shifts concerning the body politic and its relationship to the structure of the world and knowledge. The order of the world had for millennia served as a rationale for both the form of society and the architecture of the arts and sciences. The earth, it seemed, once hung securely suspended from a chain of being stretching up to the heavens. The realm of the heavens was that of constancy and eternity. There the constant revolutions of the crystalline spheres produced a beautiful, predictable, musical, and rational harmony. By contrast, the world beneath the moon was subject to the passions, life, death, and decay. The further down the chain of being one traveled, the more unpredictable and less open to rational analysis the world became.

The body politic expressed the same structure as natural bodies. The highest realm, that of the rational mind, was the order of the first social estate of the clergy. The second realm, that of the heart, represented the second estate of the military orders, where nobler passions such as valor prevailed. The third and lowest, that of the stomach and genitalia, was home to the common people, continually driven by need and lust. Their base passions were excluded both from decision making in the body politic and from the university.

The university's arts curriculum mirrored the universal and political structure, with the most rational and predictable discipline, philosophy, prevailing. Philosophy attempted to elevate knowledge making toward the divine. Sophisticated tools of reasoning were deployed to limit human subjectivity from infiltrating science. Lesser degrees of certitude led downward to the more probabilistic disciplines, drenched in human experience, such as history. At the base of the epistemic order lay the mechanical arts, or those forms of

knowledge that served the money-making needs of the lowest order of society. These were excluded from the liberal arts and from the university.

The collapse of a once seemingly reasonable, regular, and beautiful cosmic structure also threw into doubt the social structure modeled on it. Both new political ideas and new ideas about the structure of the cosmos itself shook these intertwined political, natural, and epistemic orders. The dissolution of the crystalline spheres, atomism, heliocentrism, and the specter of an infinite universe shook the structures that had held everything in place. The structure of the heavens themselves was unknown. New theories about the basic building blocks of matter proliferated on all sides. Without any certainty in the universe, how could one know how to draw lines around and within the body politic? How could one know where to place each form of knowledge, once the chain of being was severed?

New complexities and doubts concerning human nature also troubled the order of knowledge. The encounter with global cultures dramatized the diversity of human practices and characters. A growing sense of the multiple ways of being in the world encouraged skepticism concerning human access to certain and universal knowledge. Studies of the differences in human psychology suggested that all knowledge was bound up with the peculiarities of individual human wits. Early modern studies of "ingenuity" or human nature increasingly suggested that individual human minds, as well as the minds of different peoples, functioned in diverse ways. In the language of interests that transformed discussions of human interaction over the course of the seventeenth century, knowledge might fall prey to lack of activity (disinterest) or a multiplicity of competing activities (self-interest).[4] The apparent inescapability of "interest" suggested that knowledge was never pure.

This new concept also suggested, however, what in the absence of cosmic structure might make social bodies cohere or fall apart. From "to be between" (L. *interesse*), interest was that which fell between individuals and joined them

[4] Juan Huarte initiated the genre with his enormously popular *Examen de ingenios para las sciencias. Donde se muestra la diferẽcia de habilidades que ay enlos hombres, y el genere de letras que a cada vno responde en particular* (Leiden: Plantin, [1575], 1593). See Ralph Bauer, *The Cultural Geography of Colonial American Literatures* (Cambridge: Cambridge University Press, 2003). Cyriacus Herdesianus, the author of an early academic disputation on the reason of state, also wrote a dissertation on the variety of ingenuities in his *Icon animorum, seu de differentiis et notitia ingeniorum: iuxta cùm varias humani generis & seculoru[m] aetates, periodos ac ordines, tùm particulares regionu[m] & gentiu[m] mores in co[n]versatione civili ac Republicâ benè administrandâ attendendos* (Frankfurt: Eichorn, 1619). Other writers on political topics who studied the diversity of mental traits included Johann Heinrich Boeckler, *Characteres politici Velleiani sive notitia ingeniorum* (Strasbourg: Mülbe, 1641) and Johann Balthasar Schupp, *Proteus sive de dignoscenda ingeniorum varietate* (Marburg: Schadewitz, 1656). Schupp argued in *De arte ditescendi* (N.A.: N.A., 1648), 39, that the majority of political and oeconomic prudence consisted in the diagnosis of the diversity of ingenuities. Johann Daniel Major examined different types of genius and the problems they posed for knowledge in *Genius errans sive de ingeniorum in scientiis abusu* (Kiel: Reumann, 1677), which also included a research agenda.

into a larger body. In the political arena, the social skepticism provoked by concepts of interest encouraged an era of written constitutions and utopias, that is, the designation of "institutional contrivances to enable government to proceed without personal dependence in a world of deficient actors."[5] These same concerns prompted the development of learned institutions and technologies mediating and directing future epistemic interaction, such as the wish list.

The list reflected a recognition of the diversity of both subjects and objects. It collected those diverse and potentially competing interests into an aggregate. Such a collected multiplicity of desiring subjects and desired objects proved popular because it represented an aggregate of diverse, embodied human knowers, that is, a "body scientific" that reflected current views of the body politic. Many proposals for collaborative learning did not attempt to discipline diversity out of human nature but rather to turn a defect into an advantage through carefully administered social mixtures.

The first devisers of collective wish lists in the early seventeenth century – Francis Bacon and his German contemporary Jakob Bornitz – were both theorists of the body politic. They attempted to study, on a natural and material level, what made the body politic cohere. The body politic was not only metaphorically a body to them. It was an actual body, a Leviathan bound together by mutual sustenance, the flow of goods, and shared appetites. The stronger those shared appetites were, the stronger the body politic would be. In a potentially infinite, atomistic universe with no certain structure, shared appetites might be powerful enough to allow harmonious bodies to cohere. That was why Bornitz and Bacon developed their wish lists. The shared desires listed within them, if fulfilled, would certainly bring new powers to humankind. The very act of desiring together, however, was powerful in and of itself.

Current stories of the emergence of early modern science depict a shift toward a greater objectivity, but it was the subjective nature of human knowledge that appeared newly prominent in the seventeenth-century wish list. The wish list, by offering an alluring spectacle of the future, did not seek to discipline the passions and particularities out of humans. Rather, it drew on and excited those passions. It dramatized what the desires were that everybody shared. As a collective and purposefully miscellaneous list, it created a public interest out of the diverse appetites of humankind. Deploying controversial political and social tools, artisans of a body scientific crafted techniques to make collective knowledge advance, even when the shape of the world itself, the contours of true and false knowledge, the borders of impossibility, and the horizons of the future could not be discerned.

[5] James Colin Davis, "Utopianism," in *The Cambridge History of Political Thought 1450–1700*, J. H. Burns and M. Goldie, eds. (Cambridge: Cambridge University Press, 1991), 329–344. See also James Colin Davis, *Utopia and the Ideal Society: A Study of English Utopian Writing 1516–1700* (Cambridge: Cambridge University Press, 1981).

THE COPRODUCTION OF SCIENCE AND INTEREST

The origins of *desiderata* have grown obscure largely because an alternate genealogy linking science and interest has slipped into their place. A powerful argument connects interest to modern science, economics, and politics via the new rationalization and mechanization effected by the Scientific Revolution. This view is supported by an equation between the philosophical movement of Neostoicism, which favored the abnegation of desire in favor of reason, and new statist politics. New mechanical world views supposedly also tolled the death knell for the organic body politic, replacing it with the social-contract theories of Hobbes and Locke.[6]

Many modern histories of seventeenth-century political and economic thought thus treat economic reckoning, interest, and the reason of state as an example of newly rational and perspicuous ways of viewing the world, founded on the modern mechanical philosophy of the Scientific Revolution. According to one history of the "body politic," it was Francis Bacon's "materialism and rejection of the Paracelsians" that destroyed "the philosophic underpinnings of the validity of the analogy." Copernicus, Galileo, and Newton supposedly all had a role to play in developing mechanical, rational social contracts.[7] In another account, Machiavelli serves, anachronistically, as the "Galileo of politics." Adam Smith purportedly based his economics on seventeenth-century mechanical inventions and Newtonian physics. James Harrington grounded his theory of the state within Harvey's new physiology. Bacon, Descartes, and Newton are seen as among the scientific founders of political economy.[8]

Curious, improbable, and seemingly eccentric wish lists fit rather poorly within such positivist narratives. Little wonder that the fact that figures such as Bacon, Leibniz, and Boyle drew up lists of magical, mythical, and alchemical

[6] Gerhard Oestreich, *Geist und Gestalt des frühmodernen Staates* (Berlin: Duncker & Humbolt, 1969). Richard Tuck, *Philosophy and Government, 1572–1651* (Cambridge: Cambridge University Press, 1993). Lisa Sarasohn, "Motion and Morality: Pierre Gassendi, Thomas Hobbes and the Mechanical World-View," *Journal of the History of Ideas* 46:3 (1985), 363–379.

[7] D. G. Hale, *The Body Politic: A Political Metaphor in Renaissance English Literature* (The Hague: Mouton, 1971), 108 and 129.

[8] Richard Hadden, *On the Shoulders of Merchants: Exchange and the Mathematical Conception of Nature in Early Modern Europe* (Albany: State University of New York Press, 1994), I. Bernard Cohen, "Harrington and Harvey: A Theory of the State Based on the New Physiology," *Journal of the History of Ideas* 55:2 (1994), 187–210, Deborah Redman, *The Rise of Political Economy as a Science: Methodology and the Classical Economists* (Cambridge, MA: MIT Press, 1997), and to a lesser degree, Andrea Finkelstein, *Harmony and the Balance: an Intellectual History of Seventeenth-Century English Economic Thought* (Ann Arbor: University of Michigan Press, 2000). For a reassessment of a frequently cited relationship between Isaac Newton and Adam Smith, see Leonidas Montes, "Newton's Real Influence on Adam Smith and its Context," *Cambridge Journal of Economics* 32 (2008), 555–576. Machiavelli has been termed the "Galileo of politics," although he never described the state as a machine, as discussed by Barbara Stollberg-Rilinger, *Der Staat als Maschine: zur politischen Metaphorik des absoluten Fürstenstaats* (Berlin: Duncker & Humblot, 1986), 42–44.

desires goes unmentioned in these narratives, as well as in older narratives of the idea of progress more generally.[9] Even Germano Maifreda's recent *From Oikonomia to Political Economy*, with its refreshingly broad chronological, cultural, and disciplinary purview, relates economic ideas to a familiar notion of the Scientific Revolution.[10] Galileo, Copernicus, Newton, Bacon, Locke, Leibniz, and many other members of the canon make an appearance. For Maifreda, it is still important that these figures be shown purifying Renaissance thought "from its esoteric premises," as he argues in the case of Bacon. Maifreda notes one of Bacon's lists, namely the "inventory of the possessions of man, wherein should be set down and briefly enumerated all the goods and possessions (whether derived from the fruits and proceeds of nature or of art) which men now hold and enjoy." Bacon's inventory, according to Maifreda, offered a newly perspicuous beginning for science "cleansed" from the past. He sees Bacon's listing of current possessions as a "classificatory procedure that constitutes a point of departure for the rigorous knowledge, free from magic inheritances, of what humanity possesses and enjoys."[11] However, the inventory Bacon describes, as will be discussed at great length in a later chapter, was in fact a part of his recommendations *for* magic. Tellingly, Maifreda does not mention Bacon's other parallel lists that also were part of Bacon's human inventory, namely the lost things, desired magical things (or *optativa*), and apparent impossibilities. Bacon's inventory points not to a newly clarified grip on rigorous knowledge, but to a willingness to engage with doubt, probability, and the murkiness of knowledge in motion.

Maifreda's work hopefully augurs much new work on the relationship between scientific, economic, and political thought. Further studies of the intersection of economics and science not based on a notion of the Scientific Revolution can help us rewrite period concepts of intellectual change in both science and society. In early modern Europe, scientific and political concepts were both moving targets. They changed and changed each other simultaneously. Neither offered a prior and stable Archimedean vantage point from which to ground the other. If scientific and political concepts coproduced each other, then their continually shifting nature must be historicized and explored together.[12]

[9] J. B. Bury, *The Idea of Progress* (London: Macmillan, 1920), R. F. Jones, *Ancients and Moderns; a Study of the Background of the Battle of the Books* (St. Louis: Washington University, 1936), Edgar Zilsel, "The Genesis of the Concept of Scientific Progress," *Journal of the History of Ideas* 6 (1945), 325–349, and Paolo Rossi, "The Idea of Progress," *Philosophy, Technology and the Arts in the Early Modern Era*, trans. S. Attanasio (New York: Harper & Row, 1970), 63–99.

[10] Germano Maifreda, *From Oikonomia to Political Economy: Constructing Economic Knowledge from the Renaissance to the Scientific Revolution*, trans. Loretta Valtz Manucci (Burlington, UK: Ashgate, 2012). Maifreda (11) refers to Paolo Rossi for his maintenance of the Scientific Revolution, despite the well-known issues with the term.

[11] *Ibid.*, 153.

[12] For the concept of coproduction, see Sheila Jasanoff, ed., *States of Knowledge: The Co-production of Science and the Social Order* (London: Routledge, 2004). For the extensive use of medical and natural configurations in politics and vice versa, see e.g. Hale, *The Body*

Historians of science have been, by and large, dissatisfied with the term Scientific Revolution for some time, although they have yet to replace it.[13] The current story of emerging empiricism abjures the teleology of narratives of the Scientific Revolution in favor of a longer term, piecemeal, and more diverse series of changes. However, today's accounts of early modern empiricism can sometimes appear all too modern, as ever greater clarity was brought to both the study of nature and the study of society, especially in the case of strongly centralized controlled states with global empires.[14] The story of changes emerging in the sixteenth and seventeenth centuries threatens to be subsumed within eighteenth-century global, imperial, and systematic empiricism, when new concepts of objectivity and new attempts at systematization crystallized.[15]

The story told here casts the seventeenth century as a precarious era when old certainties had been shaken and not yet replaced.[16] What made the period remarkable was not so much the triumph of a rational, self-explanatory, and certain perspicuity, but the ingenious instrumentalization of doubt, desire, and probabilism. The study of particulars, brought to the forefront by the controversial reason of state, dramatized how mutable and murky human affairs were, in contrast to the certainty, reason, and universality so long demanded from knowledge aspiring to the status of a science or *scientia*. As Barbara Shapiro has shown, the seventeenth-century "fact" was not manifest and easily available for empirical observation, but a doubtful, human artifact.[17] "Broken" knowledge, spurning universal systems in favor of pointilist aphorisms and essays, is often associated with experimental natural philosophers such as Francis Bacon and Robert Boyle.[18] Tacitean politics and the reason of state,

Politic (1971), J. Andrew Mendelsohn, "Alchemy and Politics in England 1649–1665," *Past & Present* 135 (1992), 30–78, and Sabine Kalff, "The Body is a Battlefield: Conflict and Control in Seventeenth-Century Physiology and Political Thought," in *Blood, Sweat and Tears: The Changing Concepts of Physiology from Antiquity into Early Modern Europe*, Manfred Horstmanshoff, Helen King and Claus Zittel, eds. (Leiden: Brill, 2012), 171–194.

[13] Katharine Park and Lorraine Daston, eds. completely abjure the term in *The Cambridge History of Science: Early Modern Science* (Cambridge: Cambridge University Press, 2006), but they do not replace it.

[14] E.g., Jacob Soll, *The Information Master: Jean-Baptiste Colbert's Secret State Intelligence System* (Ann Arbor: University of Michigan Press, 2009) and Antonio Barrera, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin: University of Texas Press, 2006).

[15] Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007).

[16] Martin Mulsow, *Prekäres Wissen: Eine andere Ideengeschichte der Frühen Neuzeit* (Berlin: Suhrkamp, 2012).

[17] Lorraine Daston, ed., *Biographies of Scientific Objects* (Chicago: University of Chicago Press, 2000) and Barbara J. Shapiro, *A Culture of Fact: England, 1550–1720* (Ithaca: Cornell University Press, 2000).

[18] Stephen Clucas, "A Knowledge Broken: Francis Bacon's Aphoristic Style and the Crisis of Scholastic and Humanistic Knowledge Systems," in *English Renaissance Prose: History, Language and Politics*, Neil Rhodes, ed. (Tempe: Medieval & Renaissance Texts & Studies, 1997), 147–172.