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# The “New World of Sciences”

## The Temporality of the Research Agenda and the Unending Ambitions of Science

By Vera Keller\*

### ABSTRACT

Lists foreground multiplicity: both of objects to be pursued and, for distant objects, of far-flung networks enabling their pursuit. The future-oriented or projective list stretches such networks not only around the world but forward through time. Research agendas are one kind of future-oriented, projective list. Sketching how such lists have functioned over time, from Francis Bacon’s “The New World of Sciences, or *Desiderata*” to today’s *desiderata* lists, suggests how an early modern model of imperial expansion has shaped, in unintended ways, a scientific rhetoric of collaborative advance on shared targets.

**I**N THEIR CHOICE OF LANGUAGE, media, and format, authors who make lists implicitly employ a specific temporal scheme. Over time, however, lists can function in ways very different from those originally intended. A case in point is the list of *desiderata* (“things to be wished for,” from the Latin “*desidero*”: “to wish, to ask for”) conceptualized by Francis Bacon. Today *desiderata* serve many conceptual and practical roles that are not at all those Bacon intended. Nevertheless, the shape in which he chose to cast them four centuries ago has had important effects. Most important, the fact that Bacon’s own *desiderata* were never completely fulfilled has helped shape the idea of unending advancement.

Bacon’s *desiderata* were printed in the conclusion of the Latin edition of his *Advancement of Learning*. They appeared as a list of titles for as-yet-unwritten chapters, at the time a common way to frame projects for future knowledge. The work as a whole was entitled “The New World of Sciences, or *Desiderata*.”<sup>1</sup> The Latin edition was suited for a learned,

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<sup>1</sup> Francis Bacon, “Novus orbis scientiarum, sive Desiderata,” in *Opera Francisci Baronis de Verulamio . . . Tomus primus: Qui continet De dignitate & Augmentis scientiarum libros IX*, Vol. 1, ed. William Rawley (London, 1623), pp. 491–493. See also Peter R. Anstey, “Locke, Bacon, and Natural History,” *Early Science and Medicine*, 2002, 7:65–92; Richard Yeo, “Between Memory and Paperbooks: Baconianism and Natural History

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international audience. In presenting a printed rather than a manuscript list, Bacon signaled that he intended his *desiderata* to be fulfilled gradually, over time, and by more than one person. Once achieved collectively, the *desiderata* would result in a magisterial conceptual work encompassing all of learning. “The New World of Sciences” can be contrasted with the relatively humble title of Bacon’s “Catalogue of Particular Histories,” printed as part of his *Parasceve ad historiam naturalem* (1620) and including 130 desired topics for treatment in natural history. While certainly ambitious in their own way, such histories did not encompass the discoveries in metaphysics that Bacon believed necessary for “radicall and fundamental alterations” in human power over nature.<sup>2</sup> Such discoveries would be included in “The New World of Sciences.” The ambition of the title indicated the total scope of change such knowledge would effect, when humankind’s epistemic journey would conclude at the shores of a new world.

This was not to be. Composing *desiderata* lists has since become a widespread practice across many disciplines. Many researchers, such as G. W. Leibniz (who will be discussed later in this essay), did justify their investigations by the fact that Bacon had included their research topic among his *desiderata*. Some even entitled whole works with the distinctive “chapter titles” of Bacon’s *desiderata*.<sup>3</sup> However, the hopes expressed by Bacon’s list were never entirely fulfilled. Those most ardently desired discoveries in metaphysics and logic that could complete knowledge and bring an end to the interim practice of list making were never made.<sup>4</sup> The failure satisfactorily to address the items on the list over time helped shape the idea of scientific advance as an unending journey.

In proposing conquests yet to be achieved, Bacon’s list differed from his ancient models, such as Pliny, whose work had enrolled the listing of nature in the service of empire. As Trevor Murphy has described, a vast range of conquered nature, put on parade in ancient Rome, testified to the extent of Roman power. Empire both made Pliny’s natural historical project possible and was displayed within it. The parade of nature unfurled in the pages of Pliny’s encyclopedia and in actual processions through the city.<sup>5</sup> For Bacon, writing in the era of competing overseas empires, the imperial list of knowledge advanced not so much in a march through the capital as in the navigation of ships at sea. More important, in contrast to the urban triumphal march that followed a successful campaign, the navigation toward epistemic goals indicated an advancing campaign rather than a conquest already achieved.

This difference highlights a distinction between the listing of already conquered nature and the charting of future journeys to not-yet-discovered lands. The former has attracted a great deal of attention in recent historiography, particularly because of its interest for the

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in Seventeenth-Century England,” *History of Science*, 2007, 45:1–46; Michael Hunter, “Robert Boyle and the Early Royal Society: A Reciprocal Exchange in the Making of Baconian Science,” *British Journal for the History of Science*, 2007, 40:1–23; and Matthew Eddy, “Tools for Reordering: Commonplacing and the Space of Words in Linnaeus’ *Philosophia Botanica*,” *Intellectual History Review*, 2010, 20:227–252.

<sup>2</sup> These histories ranged across objects large and small, from “A history of heavenly bodies” to “A history of excrement, spit, urine, sweat, feces, hair of the head, body hair, hangnails, nails, and the like.” Francis Bacon, “Catalogus historiarum particularium, secundum Capita,” in *Parasceve ad historiam naturalem* (London, 1620), pp. 25–36, “Historia coelestium; sive astronomica” and “Historia excrementorum; Sputi, urinarum, sudorum, sedimentorum, capillorum, pilorum, rediviarium, unguium, & similium”; and Bacon, *Two Bookes of the Proficiency and Advancement of Learning, Divine and Humane*, Vol. 2 (London, 1605), p. 24.

<sup>3</sup> See, e.g., Anon., *Satyræ seriae; or, The Secrets of Things* (London, 1640); and Arnold Wesenfeld, *Georgica animi et vitae* (Frankfurt on the Oder, 1696).

<sup>4</sup> See, e.g., Lisa Jardine, *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: Cambridge Univ. Press, 1974), p. 149.

<sup>5</sup> Trevor Morgan Murphy, *Pliny the Elder’s Natural History: The Empire in the Encyclopedia* (Oxford: Oxford Univ. Press, 2004).

relationship between the sciences, colonization, and early modern empires. Historians have studied lists that aided the collective storage, retrieval, and transmission of past knowledge, including encyclopedias, indexes, commonplaces, schemata, and archive finding lists. Much attention has been paid to lists fashioned to aid observation, including collection catalogues, methodical travel guides, and query lists. The political collection of statistics has been connected to inventorying natural resources.<sup>6</sup>

Such lists helped move existing natural particulars through space or arrange them within space—for example, Ulisse Aldrovandi’s “Catalogue of birds I desire that are caught in the Trentino,” mentioned by Valentina Pugliano in her essay in this Focus section. Lists that collect past and current objects in and from actual spaces can be distinguished from the chapter titles advanced in “The New World of Sciences,” which located not-yet-extant objects within a conceptual space. Lists oriented toward actual geography and extant objects certainly would be a necessary step for arriving at some of Bacon’s *desiderata*, such as his “Inductive History, or Natural History arranged for the composing of Philosophy [*Historia Inductiva, sive Historia Naturalis in Ordine ad condendam Philosophiam*].” However, Bacon did not think an “Inductive History” itself already existed. That was why he listed it as a *desideratum* among other objects epistemically still more distant, such as “The part of metaphysics concerning the forms of things [*Pars metaphysicae de formis rerum*].”

*Desiderata* lists and empirical lists related objects to individual researchers in very different ways. *Desiderata* surpassed the abilities and lifetimes of individuals. Thus, unlike actual objects, *desiderata* could and indeed had to be distributed through time and among individual researchers. *Desiderata* reified epistemic objects, giving them a status and a name (“Inductive History”) analogous to material and extant objects (e.g., birds). Simultaneously, however, the list broke down and suspended *desiderata* in a long-term state of the not-yet-discovered. Individuals contributed their grain of sand toward the gradual “supplying” of the pulverized *desideratum*—by contributing some work toward the writing of “Inductive History,” for instance.

The multiplicity of both subjects and objects of *desiderata* placed individual inquiries within a much larger chronological and social framework. Perhaps paradoxically, the very difficulty in obtaining some of the greatest *desiderata* appears to have alleviated the concerns about social status, objectivity, and personal credibility that plagued natural historical collecting practices. Recent studies, including James Delbourgo’s contribution to this Focus section, have stressed how the gathering of global natural particulars was rather more problematic to manage from metropolitan centers than natural historical

<sup>6</sup> Regarding lists pertaining to past knowledge see, e.g., Ann M. Blair and Jennifer Milligan, eds., *Toward a Cultural History of Archives*, *Archival Science*, 2007, 7(4); and Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age* (New Haven, Conn.: Yale Univ. Press, 2010). Regarding lists meant to aid observation see, e.g., Justin Stagl, *A History of Curiosity: The Theory of Travel, 1500–1800* (Chur, Switzerland: Harwood, 1995); Joan-Pau Rubiés, “Instructions for Travellers: Teaching the Eye to See,” *History and Anthropology*, 1996, 9:139–190; and Jessica Keating and Lia Markey, eds., *Captured Objects: Inventories of Early Modern Collections*, *Journal of the History of Collections*, Fall 2011. Regarding the connection of the political collection of statistics and inventorying natural resources see Pamela Smith, *The Business of Alchemy* (Princeton, N.J.: Princeton Univ. Press, 1994); Alix Cooper, *Inventing the Indigenous: Local Knowledge and Natural History in Early Modern Europe* (Cambridge: Cambridge Univ. Press, 2007); Justus Nipperdey, “‘Intelligenz’ und ‘Staatsbrille’: Das Ideal der vollkommenen Information in ökonomischen Traktaten des 17. und frühen 18. Jahrhunderts,” in *Information in der Frühen Neuzeit: Status, Bestände, Strategien*, ed. Arndt Brendecke, Markus Friedrich, and Susanne Friedrich (Berlin: LIT, 2008), pp. 277–299; and Barbara Segelken, *Bilder des Staates: Kammer, Kasten und Tafel als Visualisierungen staatlicher Zusammenhänge* (Berlin: Akademie, 2010).

programs (such as Bacon's "Catalogue of Particular Histories") often imagined.<sup>7</sup> Empirical list makers struggled to catalogue knowledge accurately over vast distances and to pin words on the list very closely to things. This entailed attempts to discipline the work of informants across geographical and social distance. By contrast, many authors of seventeenth-century future-oriented or projective lists allowed a great degree of doubt to persist within their lists.<sup>8</sup> Seemingly dubious projects were welcomed onto knowledge wish lists by gentleman-philosophers such as Robert Boyle (who is discussed below). They served as markers for what humankind might achieve together, rather than as claims concerning what any self-interested and therefore suspect individual could do. As collaborative desires for collective advancement, such markers served to expand the horizon of possibility, to the benefit of humankind.

Bacon described his goal of widening the horizons of possibility in the form of an imperially conceived projective list for all humankind: the "Inventorie of the estate of man" (a subset of natural magic and itself a *desideratum*). This inventory would include an empirical list of all things already possessed by mankind, a projective list of those things desired for the future (optatives), and a list of those things that were reputed to be impossible. Tempted forward by desire, yet somewhat restrained by the concept of impossibility, these lists would advance human knowledge into uncharted waters, past mere "coastings along the shoare." Pushing forward the limits of presumed impossibility would, as Bacon said in the *New Atlantis*, enlarge "the bounds of Humane Empire, to the Effecting of all Things possible."<sup>9</sup> According to Plato, navigation past the columns of Hercules had been blocked by the sunken empire of Atlantis. Lists of desired, not-yet-existent things, such as the "*magnalia naturae*" listed following *New Atlantis*, stood as geographical targets, indicating the expanded borders of knowledge's future empire.

Without the final conquest of a new scientific logic, however, no means existed for predicting where the final edge of human knowledge might lie. How could one determine which things were not possible? Lists of impossibilities and nonentities proliferated around Europe, including "the quadrature of the circle, the duplication of the cube, perpetual motion, the philosopher's stone, judicial astrology, and magic" or "the philosopher's stone, the Alkahest, flexible glass, perpetual light, a hyperbolic burning mirror, longitude, quadrature of the circle, and perpetual motion." The nonpredictive nature of such lists pointed to how hazy the limits of possibility were. Johann Joachim Becher underscored this point by pairing fifty-one projects that appeared rational but did not succeed in practice with fifty-one projects that appeared "foolish, irrational, and impossible" but succeeded in practice.<sup>10</sup>

The proper way to compose a projective list, edging toward but not exceeding the bounds of the possible, might seem to depend more on style than on any predictive theory.

<sup>7</sup> Ralph Bauer, *The Cultural Geography of Colonial American Literatures* (Cambridge: Cambridge Univ. Press, 2003), pp. 14–26; and James Delbourgo and Nicholas Dew, eds., *Science and Empire in the Atlantic World* (New York: Routledge, 2008), pp. 1–6.

<sup>8</sup> Vera Keller, "Accounting for Invention: Guido Pancirolli's Lost and Found Things and the Development of *Desiderata*," *Journal of the History of Ideas*, 2012, 73:223–245.

<sup>9</sup> Bacon, *Advancement of Learning* (cit. n. 2), Vol. 2, p. 24; and Francis Bacon, *New Atlantis* (London, 1658), p. 26.

<sup>10</sup> Christophe Dupuy, Pierre Dupuy, and Jacques Dupuy, eds., *Perroniana et thuana* (Köln, 1669), p. 46; Jacob Leupold, *Theatrum machinarum generale* (Leipzig, 1724), p. 31; *Non-entia chymica, sive catalogus eorum operum, operationumque chymicarum, quae, cum non sint in rerum naturae, nec esse possint* (Frankfurt, 1645); and Johann Joachim Becher, *Närrische Weißheit und Weise Narrheit* (Frankfurt, 1682).

In 1661, Henry Oldenburg complained to Boyle about a claimed list of inventions on such stylistic grounds. An unnamed “advocate at Rouen” had bid

all ye world to make bonfires, because henceforth marchants and seamen shall be enabled to saile agst wind and tide, husbandmen to plough without horse or oxen, all yt use waggons, mills, watches etc. to make all these machines mouve uncessantly of ymselves. To ye perpetuum Mobile he Joynes ye promise of ye Quadrature of ye Circle, ye Secret of Longitudes, ye Causes of ye Reciprocation of ye Sea, of ye Winds and of Intermitting Feavers. I beleeeve himself was in a continuall raving one, when he wrote this peece, considering ye commonnes of what he saith and ye flatnes of his Style, especially ye confidence and ostentation, wherewith he delivers all.<sup>11</sup>

Oldenburg was referring to a work published by the Rouen lawyer Jacques Le Royer in 1660, which included the chapter titles for a projected future book. Le Royer enumerated eighteen inventions, from the quadrature of the circle to universal language and writing. He incorporated many of these into the design of a triumphant naval chariot that he imagined parading up the Seine for Louis XIV’s 1660 entry into Paris. A galley would move on the Seine without sails, carrying on its bridge an incessantly parading chariot. The chariot would bear a perpetual mill and a perpetual clock, both continually turning, while water continually jetted from the galley and fell as rain. A mechanical eagle would survey the weather, carry messages, “discover the longitudes” (with the help of the perpetual motion devices), and dive from the sky to present Louis XIV with an olive branch.<sup>12</sup>

Le Royer put his finger on the seemingly impossible engineering and abundant stage machinery Louis would in fact employ.<sup>13</sup> Indeed, witnessing the parade of a naval chariot such as this on the Seine in the 1670s would inspire Leibniz to conceptualize a newly spectacular form of education in the form of a street carnival.<sup>14</sup> What, then, did Oldenburg find so objectionable about Le Royer’s list? Boyle himself would support the idea of wish lists and had included in one such list of his own not only some of the “*magnalia naturae*” of the *New Atlantis* but several other commonly assumed impossibilities (including “The practicable & certain way of finding Longitudes,” the transmutation of metals, malleable glass, the Alkahest, hyperbolic mirrors, and perpetual light).

Oldenburg objected to Le Royer’s “commonnes,” “flatnes,” “confidence and ostentation.” Le Royer did not include some of the curiously counterintuitive desires one finds in Boyle, such as “Great strength & agility of Body, Exemplify’d by that of Frantick

<sup>11</sup> Henry Oldenburg, *The Correspondence of Henry Oldenburg*, 11 vols., Vol. 2: 1641–1662, ed. A. Rupert Hall, Marie Boas Hall, and Eberhard Reichmann (Madison: Univ. Wisconsin Press, 1965), p. 440.

<sup>12</sup> Jacques Le Royer, *Les causes de flux et reflux de la mer, des vents, et de la fièvre intermittente* (Paris, 1660), p. 34.

<sup>13</sup> Jean-Marie Apostolidès, *Le roi-machine* (Paris: Editions de Minuit, 1981); and Chandra Mukerji, *Impossible Engineering: Technology and Territoriality on the Canal du Midi* (Princeton, N.J.: Princeton Univ. Press, 2009).

<sup>14</sup> Gottfried Wilhelm Leibniz, “Drôle de pensée,” in *Sämtliche Schriften*, Ser. 4, Vol. 1 (Berlin: Akademie, 1970), pp. 562–568. See also Herbert Breger, “Becher, Leibniz und die Rationalität,” in *Johann Joachim Becher (1635–1682)*, ed. G. Frühsorge and G. F. Strasser (Wiesbaden: Harrasowitz, 1993), pp. 69–84; Jan Lazardzig, “‘Masque der Possibilität’: Experiment und Spektakel barocker Projektentmacherei,” in *Spektakuläre Experimente: Praktiken der Evidenzproduktion im 17. Jahrhundert*, ed. Helmar Schramm, Ludger Schwarte, and Lazardzig (Berlin: De Gruyter, 2006), pp. 176–212; and Matthew L. Jones, *The Good Life in the Scientific Revolution: Descartes, Pascal, Leibniz, and the Cultivation of Virtue* (Chicago: Univ. Chicago Press, 2006), pp. 180–187.

Epileptick and Hysterical Persons.”<sup>15</sup> More important, he claimed that, although these common desires had been out of reach for so many others, he had succeeded in achieving them all by himself. Neither the wish lists proposed by Bacon nor those collected by Boyle were intended to be fulfilled by an individual. Rather, both Bacon and Boyle referred to the work of individual “approximations,” small steps toward the fulfillment of collective *desiderata*.

This was more than a stylistic difference. Le Royer’s list paraded a collection of claims to already extant abilities. Boyle’s list was a tool of skepticism concerning our abilities to know the limits of the real, rather than a sign of certainty. He listed objects as conceptual goals for a collaborative journey. An individual did not need to prove an ability to produce the desired object for the journey to be worthwhile, since approximations might prove fruitful even if ultimate goals remained always out of reach. Boyle’s own wish list (a list of optatives, one of Bacon’s genres of future-oriented lists) has recently been celebrated as the “Wishlist of a Restoration Visionary” who could pinpoint the future.<sup>16</sup> However, his lists were not predictions. Boyle’s wish list suspended these objects in a state of continued doubt and thus invited continued investigation. Alongside this wish list, he offered another list of the administrative tactics that would aid collaborative research. These included “Recompense for Approximations,” suggesting that even partial progress deserved reward.

The communal wish list allowed individuals to tackle seemingly impossible projects without claiming the ability to achieve any conclusive result. Throughout his career, Leibniz drew on this idea to justify attempts at ambitious problems. For example, in the *Combinatory Art*, he wrote, “Because Verulam put it in the catalogue of desiderata in his *Augmentis Scientiarum*, it should be considered sufficient, if we arouse a suspicion of such an art for men, which another may produce with incredible benefit for mankind.”<sup>17</sup> Even if a single person did not achieve the desired object, the established authority of the person who placed the item among the *desiderata* justified the quest. Leibniz drew up his own wish lists in imitation of Bacon—for example, the catalogue of *desiderata* he published in his 1667 legal dissertation. He also used the concept of communally desired objects to advance his particular investigations toward presumed impossibilities. Perpetual motion, as Justin Smith has discussed, was central to Leibniz’s biological investigations, and the quadrature of the circle, as Matthew Jones has pointed out, provided a turning point in his mathematical investigations leading toward the calculus.<sup>18</sup>

Leibniz’s ultimate goal, like Bacon’s, remained the discovery of a “general science”; and, like Bacon, he never achieved it. He did, however, continue to develop the rhetoric

<sup>15</sup> Royal Society, London, Boyle Papers, Vol. 8, fols. 207v–208v, [http://www.bbk.ac.uk/Boyle/boyle\\_papers/bp08\\_docs/bp08\\_207v–208r.htm](http://www.bbk.ac.uk/Boyle/boyle_papers/bp08_docs/bp08_207v–208r.htm) (accessed 29 July 2008). Boyle repeated this list in Vol. 36, fols. 77v–78r, in the 1670s and 1680s. This volume contains material composed ca. 1658 for the second volume of a planned work on the usefulness of natural philosophy. See Robert Boyle, “Usefulness of Natural Philosophy, II, 2,” in *The Works of Robert Boyle*, 14 vols., Vol. 6: 1668–71, ed. Michael Hunter (London: Pickering & Chatto, 2000), p. liv; and Hunter, *The Boyle Papers: Understanding the Manuscripts of Robert Boyle* (Aldershot: Ashgate, 2007), p. 451.

<sup>16</sup> Ian Sample, “Robert Boyle: Wishlist of a Restoration Visionary,” *Guardian*, [www.guardian.co.uk](http://www.guardian.co.uk) (accessed 3 June 2010).

<sup>17</sup> Gottfried Wilhelm Leibniz, *Dissertatio de arte combinatoria* (Leipzig, 1666), p. 34: “et quod in catalogo desideratorum suis augmentis Scientiarum Verulamius fecit, satis habituri, si suspicionem tantae artis hominibus faciamus, quam cum incredibili fructu generis humani alius producat.”

<sup>18</sup> Gottfried Wilhelm Leibniz, *Nova methodus discendae docendaeque Jurisprudentiae* (Frankfurt, 1667); Justin E. H. Smith, *Divine Machines: Leibniz and the Sciences of Life* (Princeton, N.J.: Princeton Univ. Press, 2011); and Jones, *Good Life in the Scientific Revolution* (cit. n. 14).

of always expanding research frontiers. He based such expansion on empirical lists but moved past them. Human happiness required an exact, yet nonsystematic, inventory, greatly different from “systems and dictionaries, and composed only of a number of lists, enumerations, tables, or progressions,” supplying a “catalogue of facts” as the basis for further reasoning.<sup>19</sup> Listing what was already known would enable mankind to cease over-cultivating the same plot of land and would hence be able to “expand our frontiers [*frontières*].” Surveying already populated areas would reveal “the areas still neglected and empty of people.” One could then “send colonies to make new plantations in the least well known part of the Encyclopedia” and prosecute “the conquest of new lands.” The new lands offered both space and new materials suiting different inclinations and abilities.<sup>20</sup> Bacon’s projective lists helped shape this rhetoric of advance on designated targets. Such a campaign required lists of conquests achieved and of troops, supplies, and objectives to be attained. For instance, Johann Daniel Major included in his 1670 *Journey to the New World without a Ship and Sail* a list of thirty supplies required for intellectual voyaging toward the “Port of Perfection,” including appetite, ingenuity, wonder, and optimism.<sup>21</sup>

The notion of intellectual voyaging has persisted, although *desiderata* have fundamentally changed. They now include lists of already extant mundane objects (such as specimens and books), which Bacon would never have considered *desiderata*. Philosophers still also compose ambitious epistemic *desiderata*, which for some play a central role as goals toward which scientific inquiry continually advances.<sup>22</sup> Perhaps most novel, and most at odds with Bacon’s intentions, has been the recent evolutionary concept of “biological *desiderata*.” Biological organisms, parasites, and even parents and children have sometimes coinciding and sometimes conflicting *desiderata* lists. Such lists are dictated by the inexorable if nonteleological demands of reproduction, not by conscious human authorship, and they are fulfilled not by collaborative human effort but by genetic code. Rather than a means to unite humankind against nature, the concept of *desiderata* now divides individual organisms, both from each other and from human-authored cultural and moral goals.<sup>23</sup>

The “New World of Sciences, or *Desiderata*” envisioned by Bacon has changed beyond

<sup>19</sup> Gottfried Wilhelm Leibniz, “Nouvelles Ouvertures” (ca. 1686), in *Sämtliche Schriften und Briefe*, 4 vols., Vol. 4: *Philosophische Schriften* (Berlin: Akademie, 1999), pp. 686–691, on p. 691.

<sup>20</sup> Gottfried Wilhelm Leibniz, “Recommandation pour instituer la science générale,” in *Sämtliche Schriften und Briefe*, Vol. 4, pp. 692–713, on p. 697: “nous nous garderions de faire ce qui a esté fait, et au lieu de tourner dans un petit champ, comme ces bestes qu’on a attachées par les pieds, nous irions plus loin et ferions reculer nos frontières. Car en decouvrant tout d’une vue toute cette region d’esprit, déjà peuplée, on remarqueroit bientost les endroits encor negligés et vuides d’habitans. La Geographie des terres connues donne moyen de pousser plus loin les conquestes des nouveaux pays: On envoyeroit des colonies pour faire des plantations nouvelles dans la partie la moins connue d’Encyclopedie, où chacun trouveroit de quoy monstrier son adresse et sa capacité en défrichant quelque matiere conforme à son inclination; au lieu qu’à present on est à l’estroit, et on s’incommode en remuant tousjours les mêmes choses, et en se contestant ce peu de terrain qu’on cultive dans les sciences.” This passage is discussed in Jones, *Good Life in the Scientific Revolution* (cit. n. 14), pp. 240–241.

<sup>21</sup> Johann Daniel Major, *See-Farth nach der Neuen Welt ohne Schiff und Segel* (Kiel, 1670), p. 242.

<sup>22</sup> See, e.g., Mario Bunge, “Seven Desiderata for Rationality,” in *Rationality: The Critical View*, ed. Joseph Agassi and Ian Jarvie (Dordrecht: Nijhoff, 1987), pp. 5–16; and William Alston, “Epistemic Desiderata,” *Philosophy and Phenomenological Research*, 1993, 53:527–551. Carl Hempel defends such epistemic *desiderata* as not merely “the use of a set of means aimed at the improvement of scientific knowledge.” Rather, “we might plausibly consider the goal of scientific inquiry to be the development of theories that ever better satisfy the desiderata.” Carl G. Hempel, “Turns in the Evolution of the Problem of Induction,” *Synthese*, 1981, 43:389–404, on p. 404.

<sup>23</sup> Richard Dawkins, “Parasites, Desiderata Lists, and the Paradox of the Organism,” *Parasitology*, 1990, 100:63–73 (fulfillment by genetic code); and Robert A. Hinde and Joan Stevenson-Hinde, “Attachment: Biological, Cultural, and Individual Desiderata,” *Human Development*, 1990, 33:62–72 (*desiderata* as dividers).



recognition. However, its former shape contributed to the idea of interlocking research specialties moving forward in concert. Researchers continue to conceptualize the advancement of knowledge as a process of filling in the gaps of scholarly literature. But advancement toward what? For Bacon, a new world lay at the end of the journey. Failure to reach that world has bequeathed to us the idea of unending advance. The edge of the horizon always retreats before us, and knowledge remains continually at sea.