

PRINTING THE BOOK OF NATURE: RENAISSANCE, SCIENTIFIC REVOLUTION, & THE ADVENT OF THE PRINTING PRESS

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*Plato is my friend,
Aristotle is my friend,
but a greater friend is truth.¹*

~Sir Isaac Newton

I. The Heavy Hand of Antiquity: The Seeds of Greco-Roman Natural Philosophy, and the Harvest of Medieval Cosmology

THE HISTORICAL sweep and ambition of the Hinkes Collection are, within the space of less than three hundred books, staggering.² At one and the same time it reaches back nearly two millennia, from the era of the invention of printing by moveable type to the very origins of natural philosophy in ancient Greece and Rome, and forward through the past five hundred years, marking along the way many of the greatest moments in the history of scientific discovery from the Scientific Revolution to the modern age. In this way it provides both telescopic visions of the very nature of the universe and the distant heavens, and subatomic reflections upon the most fundamental building blocks and motive forces of matter itself. Although it is a highly selective collection of rare books in the history of scientific discovery, one is nonetheless significantly challenged to find any appreciable gaps in the portion of the collection predating the advent of the Newtonian Revolution and its constituent mathematical laws that, together, shattered the ancient Aristotelian framework of the natural world, replacing it with a new, and entirely mechanical, physics and cosmology.

At first glance there are standard texts that seem to be conspicuously absent from the collection, such as Pliny the Elder's encyclopedia of the natural world, the *Naturalis Historia*, arguably one of the most ubiquitous and influential works of natural philosophy ever produced in the ancient world. The absence of this monument of early science, and of others like it, are by no means glaring lacunae, however. Pliny, and many

of his other Roman contemporaries and immediate successors for that matter, cannot rightly be thought of as pioneers of new scientific theories and discoveries. Rather, they were compilers and synthesizers of the philosophical conjectures of others, latter-day framers of the wisdom literature and philosophical discourses of a fledgling ancient world of ideas about the essential nature of the larger Book of Nature created for all men to read and, thereby, unlock its secrets in the service of man's estate on earth. Their imaginations were not fired by a philosophical or empirical impulse to espy something new and different about the created world, but rather by the ambition of the encyclopedist. They were bearers of nature's cornucopia—that mythical horn of plenty from which all the fruits of knowledge might emerge in the form of all the best words and thoughts hitherto written or said.

It is precisely this sort of distinction that seems to have helped shape Dr. Hinkes' own collecting vision and connoisseurship: his focus upon, and fascination with, those texts and historical contexts that signaled "Eureka!" moments in the progress of human observation and invention—touchstones and true pioneering discoveries, both speculative and empirical, in man's struggle to unlock the apparent mysteries of the heavens and the earth. In Dr. Hinkes' thinking and collecting, the great moments of natural philosophy and empirical science clearly constituted high points in a larger historical process that, in truth, has ever been an unending enterprise. It is a rationale that may also help one to understand his determination to collect, in parallel to science, momentous works in the history of printing itself—works that both embody and mirror transformations in the larger history of ideas, from the coincident Renaissance revival of classical antiquity and the technological revolution that led to the invention of the printing press itself, all the way up to the twentieth century and Dr. Hinkes' own lifetime. It is this process of constant and intrepid exploration, punctuated by essential moments of remarkable invention and discovery, that invariably shaped and transformed subsequent ways of thinking, giving way to entirely new cosmologies and physical laws of nature.

The basal elements of this architecture of scientific discovery were, of course, shaped in the ancient pagan worlds of Greece and Rome, and subsequently elaborated into an elegant latticework of "divinely inspired" pagan and Judeo-Christian ideas over the course of the Middle Ages, eventually reconciling an Aristotelian natural philosophical orthodoxy with Roman Catholic religious dogma. With the inspired return to the ancient foundations of that more elaborate framework during the Renaissance (and, indeed, many of the greatest early modern natural philosophers were also great humanists), allied with the invention of the duplicative and preservative powers of print, the great orderliness of the intermediate medieval universe was utterly transformed, never to be the same again. And yet, in each of those several eras something more about the true nature of the universe was revealed and with it, just as often and just as useful to the progress of science, something more about the nature of man and the limitations of human reason, cultural expectation, and prejudice. Though always dynamic and chang-

ing, that long arc of ideas and discoveries about the Book of Nature also invariably remained in conversation with itself and its constituent parts across history—a fact nowhere more clearly articulated in all its complexity, sophistication, and wonder than in their first and earliest instantiations in print, from their origins in the mid-to-late fifteenth century up to the early Enlightenment of the seventeenth.

Although the ancient and medieval worlds are represented in just over a half-dozen items in the Hinkes Collection, they nonetheless rank among the most monumental pre-modern contributions to natural philosophy. To these we may also add one other: a comprehensive history of the world, from the Six Days' Creation up to the year of its printing in 1493. Though hardly “scientific,” it does nonetheless present at least one magnificent full-page image visually representing the conventional medieval cosmology, included as an illustration of the author's account of the creation of the world drawn from the Book of Genesis. Hartmann Schedel's *Liber Chronicarum* (Book of Chronicles), also known simply as the “Nuremberg Chronicle” in reference to its place of publication, constitutes a composite world history based on many sources—biblical and historical, sacred and secular—and is enhanced throughout by over 1,800 individual illustrations rendered from a massive collection of some 650 engraved woodblocks (Hinkes 232). It is also worth noting, in these same material connections, that this particular masterpiece of the era of the “incunable” (i.e., books printed before 1501) is preserved in its original early stamped parchment binding bearing the name of none other than Anton Fugger, one of the great scions of the magnate German Renaissance banking family and one of the richest men in all of Europe.³

In the Genesis woodcut (see *Frontispiece*) the reader encounters a profoundly harmonious and proportionate creation encircled at its outermost layer by an enthroned God in heaven among the host of angels, their hierarchy enumerated in a list along the left-hand side of the page from the highest to the lowest—Seraphim, Cherubim, Thrones, Dominions, Principalities, Powers, Virtues, Archangels, and the lesser Angels—situating the pagan cosmology of Aristotle within a squarely Christian framework. In each of the four corners of this scheme reside the ancient Anemoi, pagan wind deities that recall the deep mythological foundations of mankind's first attempts to impose a literal anthropological order on the universe by naming the forces of nature and rendering them as gods endowed with specific characteristics—an entirely pagan tradition that had reached this particular apotheosis within the ancient worlds of Greece and Rome. In the Nuremberg Chronicle these ancient winds are represented variously by their Greek or Roman designations: Subsolanus (Gk. Apeliotes), the Roman deity of the east wind believed to bring cooling rains to crops and fields; Auster (Gk. Notus), the south wind that blows hot and humid air, ushering in both fog and storm; Zephyrus (Lat. Favonius), the Greek manifestation of the west wind, the mildest of the four and carrier of the gentlest of springtime breezes; and Aparc[t]ias (also Gk. Boreas; Lat. Aquilo), the great northern wind who blows the mighty winter winds that chill the bones of men and beasts.

Below heaven itself are arrayed the fruits of the divine labors of the Six Days' Creation, from the outermost celestial spheres down to the motionless, central earth around which all the other planets and the sun rotate. In the space between the earth and the moon are located four "sublunary spheres" comprised of the temporal essences, respectively, of earth, water, air, and fire, which, in various proportions, comprise all matter. Beyond these, one observes the lunar and superlunar heavenly spheres, each comprised of an ethereal "quintessence" that was utterly perfect and entirely incorruptible, marked both by their perfectly spherical surfaces and the eternal, circular motions of each of them around the central, immobile earth—a heavenly motion so harmonious and mathematically proportionate, in fact, that it constituted a kind of musical perfection, the *musica universalis*, or "music of the spheres."⁴ Among these spheres, in outward succession from the immobile earth, are the moon, Mercury, Venus, the sun, Mars, Jupiter, and Saturn. Concentric to these, in this most orderly of cosmologies, lie the successive outermost layers of the *firma mentum*, literally the great dome of the fixed stars believed to separate the celestial waters above from those below, fashioned by God on the second day of Creation ("And God said, Let there be a firmament in the midst of the waters and let it divide the waters from the waters," Genesis 1:6).

This Aristotelian dispensation of the heavens was further augmented by medieval natural philosophers to more closely conform to established Christian doctrines regarding the nature of the divinely created universe, largely formalized by Saint Thomas Aquinas during the High Middle Ages. One culmination of this syncretic cosmological tradition is the Hinkes copy of the third edition of Aristotle's great work on terrestrial cosmology, the *De Caelo* (Concerning the Heavens, Hinkes 10). There, Aristotle's text appears as a Latin translation derived from the Greek, which is surrounded on three sides by Aquinas' far more dense and elaborate Scholastic commentary on Aristotle. Aquinas, arguably one of the greatest of the syncretist philosophers of the Middle Ages, endeavored to harmonize the pagan with the Christian through a rigorous and systematic application of logic to both Aristotelian philosophy and established Christian theology. To this end, other heavenly, theological spheres were added and framed just beyond the firmament, the first of them the *caelum crystallinum*, a luminous, crystalline orb that was believed by some in the Middle Ages to be an icy solidity, by others a divine and immutable fluidity—a distinction that, in any event, materially accounted for the "waters" constituent to the second day of God's Creation. Beyond that was the *primum mobile*, or "prime mover," posited by Aristotle and confirmed by Aquinas as the first moveable heaven and the efficient cause of all the other planetary motions around the earth, as the heavens rose each day in the east, moving inexorably across the sky westward within each of the subordinate planetary spheres. Another purely theological geocentric sphere was also the greatest of them all, the sublime "Empyrean Heaven" where God himself dwells with the great host of angels and saints in luminous and eternal perfection.⁵

Despite this synthesizing, perfect, circular model of the heavens, the Hinkes Collec-