

Birmingham during its last years. His mind was restless, and he died unhappy at his lack of solid achievement.

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BEDE, THE VENERABLE (*b.* Northumbria, England, A.D. 672/673; *d.* Jarrow-on-Tyne, England, A.D. 735), *philosophy*.

At the canonical age of seven Bede was entrusted to the care of Benedict Biscop, founding abbot of the monasteries of Wearmouth and Jarrow (near Newcastle). In Bede's words, written in 731, "From that time, spending all the days of my life in residence at that monastery, I devoted myself wholly to Scriptural meditation. And while observing the regular discipline and the daily round of singing in the church, I have always taken delight in learning, or teaching, or writing."¹ A disciple, Cuthbert, described his death in loving but not hagiographical terms.² There are no other biographical events of record, but from the twelve octavo volumes of his extant Latin writings emerges a consistent picture of a dedicated scholar and scientist.

Apparently Bede never traveled farther than fifty miles from his monastery, but he had unusual resources there. The English settlement of Britain in the fifth to the seventh centuries suggests the European settlement of North America in the seventeenth to the nineteenth centuries. Benedict Biscop, who founded his monastery two centuries after the first English settlement, had studied at Lérins (the most famous Western school of the period) and at Rome. He brought Archbishop Theodore and Abbot Hadrian from Rome to England. Hadrian came from culturally rich North Africa, via Naples. Theodore, whose home had been the "university city" of Tarsus in Cilicia, was schooled in Greek, law, and philosophy. Later, Benedict brought John, the archchanter of St. Peter's in Rome, to teach and to compose musical texts. In Northumbria, Benedict was surrounded by students from Ireland and Frankland, including, for example, the famous Abbess Hilda of Whitby, an English princess who had been educated in Ireland and Paris. In all, he made five trips to the Continent, importing examples of all the arts and crafts and "a very rich library." His successor Ceolfrid, Bede's master and abbot, was an author and the creator of the famous *Codex Amiatinus*. Bede himself was the primary voice of this flowering English culture.

Half of Bede's volumes are scriptural exegesis, an art in which he excelled. Five of the remaining six volumes contain homilies, hagiography, history, a guide to holy places (derived from the pilgrim Arculf), religious and occasional verses, and letters. They include his renowned work, *Historia ecclesiastica gentis Anglorum*. Cuthbert reports that he composed Anglo-Saxon verse and prose, but none has survived.

The remaining volume contains Bede's several *opera didascalica*, textbooks designed for such courses in the emerging vocational curriculum of monastic schools as *notae* (scribal work), *grammar* (literary science), and *computus* (the art and science of telling time). For the study of *notae* Bede composed *De orthographia* (dealing with spelling, word formation, and so forth), in the tradition of Caper, Agroecius, and Cassiodorus. For *grammar* he composed *De arte metrica* (on versification) and *De schematibus et tropis* (on figurative language). The first contains the first known treatment of isosyllabic rhythm (*De rhythmo*), which was then supplanting quantity as the formative principle of Western verse, while the second is unique in maintaining, with evidence, that every Greco-Roman figure of speech had been anticipated in the Hebrew Scriptures.

The study of *computus* had arisen pragmatically to meet the needs of Christian monastic communities,

in which time was of the essence. The migrations of different peoples, each of whom had a different mode of reckoning time in both short and long units, and the establishment among them of convents as models for living in which the residents emphasized cycles of psalms and prayers through ordained days and years, made the study of *computus* second only to that of the grammar necessary for studying the Scriptures. Eventually *computus* attracted, as part of its discipline, most of the content (although not in those categories) of what might later be deceptively called the *quadrivium* (arithmetic, geometry, astronomy, and music). As time passed, the science necessary to physicians (largely dietary regimens and periodic phlebotomy), to agriculturists, to mariners, to historians (chronology), to geographers and cosmologists, and to musicians and versifiers was incorporated. The basic pattern for Bede's primary texts was a theoretical section (rules and formulas with explanations) and a practical section (a chronicle of world history emphasizing such "timely" events as eclipses, earthquakes, human and natural calamities), to which were appended a wide variety of calendars, tables, and formularies.

This pattern had begun to develop with Julius Africanus about A.D. 200. The Eusebius-Jerome Chronicle, which largely determined the medieval view of history, probably originated as part of such a text. Bede's earlier text of this kind, *De temporibus*, was published in 703. At about the same time, he wrote *De natura rerum*, an ancillary text on the model of Isidore's *Liber rotarum*, using sections of Pliny's *Natural History* together with patristic lore. Cosmology and natural history were traditionally (after Origen, Basil, Ambrose) linked to hexamera, that is, to commentaries on the six days of creation as described in Genesis. Bede wrote such a commentary, in which he refined some earlier statements of his own and of the Fathers. In 725 he rewrote his earlier text *On Times (De temporum ratione)*, lengthening it tenfold because, he said, "When I tried to present and explain it to some brothers, they said it was far more condensed than they wanted, especially respecting the calculation of Easter, which seemed most useful; and so they persuaded me to write somewhat more at length about the nature, course, and end of time."³ Bede reproduced or created tables of calculation, Easter tables, calendars, formularies, mnemonic verses, and the like. A letter to Plegwin defended his chronology; another, to Wicthede, explained contradictions in a document later proved a forgery.⁴

In this area three particular contributions are noteworthy. He is the first to have created, or at least to have recorded, on the basis of the Metonic nineteen-

year lunar cycle, a perpetual (532-year) cycle of Easters and to have tabulated it. True, Victorius of Aquitaine (fifth century) had created a 532-year table, and even earlier Christians had created an eighty-four-year cycle, but Bede practically reconciled the two. Bede built upon the work of Dionysius Exiguus (ca. 525) and took his anchor date, the *annus Domini*. Because annals were added in the margins of these tables and because Bede incorporated such annals with their anchor dates in his historical writing, he became the first historian to use the Christian era. His popular *Historia ecclesiastica* helped to spread the practice. Finally, he first stated the tidal principle of "establishment of port," which has been described (e.g., by Duhem) as the only original formulation of nature to be made in the West for some eight centuries. Pseudo-Isidore's *De ordine creaturarum*, almost certainly written in Bede's time and region, uses Bede's technical diction for tides, but not his principle. It is not surprising that scholars living by the North Sea, in or near Lindisfarne, an island at high tide and a peninsula at low tide, should have been concerned with observed tidal action.

In the eighth century, Boniface (Winfrid), apostle to the Germans, and innumerable other insular missionaries and wandering scholars (e.g., Alcuin), in cooperation with Carolingian rulers, developed Continental schools based on English Scholasticism. Bede's writings were the staple texts. Among Carolingian epithets for Bede were "Doctor Modernus" and "Venerabilis." From the eleventh century on, these texts were supplanted in diocesan schools by Boethian texts. Judging by extant manuscripts, the ninth century was clearly the Age of Bede on the Continent, whereas his works had virtually disappeared from England, a fact which may be explained in part by the raids of the Danes and the decline of English ecclesiastical vigor. An unknown author of the eleventh century thought Bede first a geographer, "Living in the very corner of the world, after death he lived renowned in every other corner through his books. In them he discriminatingly described at length the locations, resources, qualities of the different lands and provinces."⁵ Bede's manuscripts were more in demand in the twelfth century, but only in line with the increase for all standard authors. Another peak in the fifteenth century may reflect the reformers' search for pristine purity. Bede's greatest practical effect was on the Western calendar. His decisions (beginning the year, calculation of Easter, names of days and months, calculations of eras, and so forth) in most instances finally determined usage that was only refined, not changed, by Gregorian reform.

NOTES

1. *Historia ecclesiastica*, V, 24.
2. *De obitu Bedae*, trans. Plummer, I, lxxii–lxxviii.
3. *Praefatio*, ed. Jones, p. 175.
4. The *Liber Anatholi de ratione paschali*, ed. Bruno Krusch, in *Studien zur christlich-mittelalterlichen Chronologie* (Leipzig, 1880), pp. 311–327. See E. Dekkers and A. Gaar, *Clavis patrum Latinorum*, Sacris Erudiri III, editio altera (Bruges, 1961), no. 2303, p. 514.
5. *Patrologia Latina*, XC, 37C.

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BEECKMAN, ISAAC (b. Middelburg, Zeeland, Netherlands, 10 December 1588; d. Dordrecht, Netherlands, 19 May 1637), *physics, mechanics*.

In preparation for a career in the Reformed Church, Beekman studied letters, philosophy, and theology. As a student at Leiden from 1607 to 1610 he came into contact with the Ramist philosopher Rudolph Snell and his son Willebrord. He continued his ministerial studies at Saumur in 1612; in the interim he had privately studied mathematics and nautical science and had learned Hebrew, in Amsterdam, from the Brownist Ainsworth. After he had completed his studies, Beekman entered his father's factory, which made candles and water conduits for various purposes, as an apprentice. When his apprenticeship was over, he pursued the same trade in Zierikzee, on the isle of Schouwen, Zeeland, which provided him easy access to the equipment required for experiments in combustion, pumping, and hydrodynamics. In addition to all this, Beekman found time to study medicine—he received the M.D. from Caen in 1618—although he never practiced it.

In 1618–1619 Beekman was conrector (assistant headmaster) of the Latin school in Veere, on the island of Walcheren, his brother Jacob being headmaster. While there, he made astronomical observations with Philip van Lansbergen, a well-known Copernican astronomer. In 1619–1620 Beekman was conrector in Utrecht; he later filled the same position in Rotterdam, once again under his brother's rectorship. In Rotterdam he founded a Collegium Mechanicum, a society of craftsmen and scholars who occupied themselves with scientific problems, especially those that had technological applications.

In 1627 Beekman was appointed rector of the Latin school at Dordrecht, which under his direction grew to 600 students and became the best school in the Netherlands. There, in 1628, with the help of the magistrate he established the first meteorological station in Europe, recording wind velocity and direction, rainfall, and temperature, and making astronomical observations with his former pupil Martinus Hortensius and the Reformed minister Andreas Colvius. Among his students were Frederick Stevin, the son of Simon Stevin; Jan de Witt, who became Grand Pensionary of Holland; and George Ent, who was one of the first adherents of Harvey and one of the first members of the Royal Society. Beekman also planned a series of lectures on physics and mathematics, to be given in the vernacular, "for