P 26-27

**THE REFORMATIONS OF THE SIXTEENTH CENTURY**

**The Impact of the Protestant Reformation**

On October 31, 1517, an earnest young Augustinian canon and scripture

scholar, Martin Luther, nailed his *Ninety-Five Theses* to the door of the

Castle Church in Wittenberg. The immediate provocation was the preaching

of indulgences by an itinerant Dominican friar, Johann Tetzel, which

offended Luther both as a proud German and as a theologian concerned

about the abuses involved with this practice. An indulgence was originally

an offer of remission of the temporal punishment for a sin; later it

was extended to apply to purgatorial punishment as well. In Luther’s day

an indulgence was offered in exchange for a monetary payment to the

Church (Pelikan, 1971:134–137). Specifically, what Luther called for in his

*Theses* was an open and honest discussion of the nature of penance, the

authority of the pope, and the usefulness of indulgences for salvation. The

more general provocation was the alarming climate of ecclesiastical corruption

and theological ambiguity that had crept upon the Church since

the Late Middle Ages (Ozment, 1980:204–222). Luther wrote as a faithful Catholic theologian, and hoped that his sincere call for honest and open

discussion of the need for both theological and disciplinary reform within

the Church would be heeded.

Regrettably, reform that was both timely and thorough enough to preserve

the unity of Christendom was never achieved. For geopolitical reasons

beyond the control of the principal actors, by the time the Church

acquiesced to discussion of reform it was too little and too late. Luther had

issued his call for discussion about indulgences in 1517. Not surprisingly,

Rome, instead of agreeing, had initiated an inquisition into Luther’s activities

in 1518, but became distracted by the death of Emperor Maximillian in

1519. In public debate Luther was forced to declare his differences with the

Church, and expanded his critique with three far-reaching treatises: *On the*

*Freedom of a Christian* (dealing with the theology of justification), *The Babylonian*

*Captivity of the Church* (a broad critique of the sacramental system of

the Church), and *Address to the Nobility of the German Nation* (a statement

of the causes of growing social discontent in Germany). The appearance

of these tracts had pushed Rome too far, and Pope Leo X issued the papal

bull *Exsurge Domine* (June 15, 1520) that forbade the printing, selling or

reading of Luther’s works. Luther responded by publicly burning the bull

and the books of canon law on December 10, and Leo excommunicated

Luther on January 3, 1921.

Maximilian’s successor, the young Holy Roman Emperor, Charles V

(1500–1558), convened a general assembly of the estates of the empire,

called the Diet of Worms, in the spring of 1525, in order to address the

crisis of Luther and his proposed reformation. No quarter was shown to

the heretic monk, however, and Charles issued the Edict of Worms, effectively

putting a price on the reformer’s head. On his return journey from

the diet, Luther was kidnapped for his own protection and confined by

Prince Frederick the Wise in the Wartburg Castle. There Luther began his

translation of the Bible into German, and during the next five years he

became married, composed vernacular baptismal and wedding services,

and wrote catechisms and other works for the Protestant church. The Reformation

continued to attract converts and gathered strength throughout

the German estates. At the imperial Diet of Speyer in 1529, the followers of

Luther and the other reformers were first called “Protestants,” and in 1531

an alliance of Protestant princes formed the Smalkaldic League. Thus, by

the time the Council of Trent was convened in 1545—ironically only a year

before Luther’s death—German Protestantism was a well-established fact,

and hopes of reuniting a Christendom purified in doctrine and practice

had all but died. John Calvin’s reform of the Church in Geneva and Henry

VIII’s revolt against Rome ensured that Reformation was secure, and thus

the Council of Trent was forced, in part, to define itself in reaction to

Protestantism.

p. 30-31

**THE UNMAKING OF THE MEDIEVAL COSMOS: COPERNICUS**

**REVISES THE HEAVENS**

In the popular understanding, what most paradigmatically represents

the Scientific Revolution of the sixteenth and seventeenth centuries is the

great transformation in astronomy from the Ptolemaic cosmos to the Newtonian

universe. Early modern Europe experienced many shifts in perspective,

ranging from physiology and natural history to chemistry, geology

and other sciences. But the revolution in cosmology was the most visible

and dramatic, and it dealt with the heavens, a subject relevant not

only to science but also to religion. We must bear in mind that although

modernity has sterilized the study of “the heavens” of all but purely astronomical content, late scholastics distinguished between three interrelated

concepts: (1) the Empyrean, a theological concept concerning heaven

as the abode of God and the saints, (2) the Firmament, a biblical idea about

the waters below and the waters above that caused the Noachian flood,

and (3) the physical space in which revolved the seven planets, a concept

subject to “scientific” or natural philosophical speculation (Randles,

1999:1–8). It is thus a mistake to assume that the Catholic Church should

have been uninterested in Galileo’s campaign to interpret his telescopic

findings. Moreover, the revolution in cosmology did not remain only that;

the challenge to the received tradition of medieval astronomy served as a

powerful catalyst for what would become revolutions in thinking about

every dimension of the world, from Aristotelian physics to Galenic physiology

and medicine.

The late medieval discussion of astronomy took a decisive turn with the

work of Mikołaj Kopernik, born in Tor ґ un, Poland, on February 19, 1473.

Known to us as Nikolaus Copernicus, he was raised in the comfortable circumstances

of a wealthy burgher family and was educated at the cathedral

school (Hess, 2004:1976–1979; Rosen, 1984:55–74). When his father died in

1483, Nikolaus and his younger brother Andreas were taken under the

guardianship of his maternal uncle, Canon Lucas Watzenrode, who had

been trained in the cosmopolitan humanist atmosphere of Bologna and

later was appointed Prince Bishop of the Diocese of Warmia. Copernicus

matriculated in the renowned Jagiellonian University of Cracow, which

was strong in mathematics and boasted an endowed chair of astronomy.

His study of the theories of such luminaries as Ptolemy, Euclid, Sacrobosco,

and Regiomontanus was complemented by his own observation in

Cracow of the comets of 1491 and 1492, and of four lunar and solar eclipses

during the next two years.

Watzenrode sent the Copernicus brothers to Bologna in 1496 to further

their education. During his decade in Italy Copernicus continued his

observations of the heavens, became well versed in philosophy and classical

literature, studied medicine at Padua, and in 1503 took his degree in

canon law from the University of Ferrara. Watzenrode had arranged for

his election to a benefice in the diocese of Warmia to ensure his nephew’s

financial independence, so Copernicus returned to Poland to embark upon

his duties as a canon of Frombork Cathedral. Although not a priest, for

the next forty years he was engaged in ecclesiastical administration and

other services to the diocese, and also found time to write an important

treatise on coinage, to paint a self-portrait, and conscientiously to practice

medicine. Astronomy remained his passion, however, and in 1510 he built

a modest observatory in a tower near the cathedral.

P. 35-36

**THE CONSERVATIVE ORIGINS OF A REVOLUTION**

Copernicus’ *De revolutionibus* sits in the paradoxical position of being

on the one hand essentially a conservative work in the classical astronomical

tradition, and on the other hand a book that sparked a major

revolution in scientific thought. With the exception of a broad exposition

of the heliocentric system in the first of its six books, *De revolutionibus* is

a highly mathematical treatise that made few initial converts. Although it

was widely read in astronomical circles, fewer than a dozen committed

Copernicans can be identified before 1600 (Westman, 1986:85). To preserve the assumption of uniform circular motion, Copernicus continued to employ

Ptolemy’s idea of epicycles and eccentrics, and has sometimes been

referred to as the last great Ptolemaic astronomer.

Where Copernicus departed from the tradition of Ptolemy in a profoundly

significant way, however, was in his pursuit of the insight that

shifting the reference frame from the earth to the sun not only increased

observational accuracy, but for the first time made logical sense out of

the order of the planetary bodies. Rather than the sun, moon, and planets

with their varying dimensions having been arbitrarily assigned to widely

divergent periods and orbital angles, a heliocentric system generated an

intrinsic order. The planets farthest from the sun had the longest orbital

periods and the widest orbital angles, while those closest to the center revolved

most tightly and rapidly around the sun. Likewise, the Copernican

model also made coherent sense of retrograde motion. Instead of interpreting

the looping paths of the planets against the sidereal backdrop as being

actual celestial occurrences, Copernicus understood these motions to be

mere optical illusions resulting from the annual revolution of our terrestrial

observatory inside or outside the orbits of its fellow planets. Offering

a remarkably prescient rebuttal to Ptolemy’s objection that a moving earth

would leave any loose objects drifting westward, Copernicus suggested

two possible explanations. One was based on an Aristotelian mingling of

qualities, the other on the idea of momentum: “The reason may be either

that the nearby air, mingling with earthy or watery matter, conforms to

the same nature as the earth, or that [this] air’s motion, acquired from the

earth by proximity, shares without resistance in its unceasing rotation”

(Copernicus, 1992:I.8).

Initial reaction to Copernicus’ revolutionary postulate was guarded, although

astronomers appreciated the increased predictive accuracy of his

system. More significantly, the fruitfulness of his effort may better be measured

by the range and diversity of theories he stimulated. *De revolutionibus*

gave free rein to an incremental rethinking of astronomy and physics that

challenged the existing hierarchy of disciplines, and that within a century

would blossom into a full-scale scientific revolution. Ptolemaic astronomy

no longer offered a satisfactory architectonic vision of the cosmos, and

Copernicus was not the only thinker prepared to suggest an alternative

model. The Danish astronomer Tycho Brahe (1546–1601) proposed a “geoheliocentric”

model in which the five planets revolve around the sun,

which in turn revolves with the moon around the earth. Brahe appreciated

Copernicus’s success in circumventing the most discordant aspects of the

Ptolemaic system, but he personally could not overcome a revulsion of

ascribing to the “sluggish earth” the quick motion shared by the “ethereal

torches” (Dreyer, 2004:167–168). But Brahe did initiate a break with

another important Aristotelian assumption—the immutable nature of

the celestial spheres. First, against the Aristotelian dictum that the heavens are

immutable, he claimed that the nova observed in 1572 was in fact a new

star (*stella nova* is Latin for “new star”) rather than a closer object, because

it exhibited no parallax, that is, no progressive displacement against the

background of “fixed stars.” Second, because he observed that the comet

of 1577 undeniably looped around the sun in an orbit closer than that of

Venus, Brahe concluded that Aristotle’s solid crystalline spheres could not

exist.

p.41

**FOUNDATIONS OF THE MODERN WORLDVIEW: GALILEO**

Into this context stepped Galileo Galilei (1564–1642), a proud Italian and

faithful Catholic, mathematician and experimenter, a man often honored

with the title “father of modern science.” Galileo’s historic encounter with

church officials in Rome is the incident most often adduced as an archetype

of the “conflict model,” shorthand for an assumed state of persistent warfare

between courageous scientific pioneers and obscurantist ecclesiastical

authorities. A cascade of recent historiography confirms, however, that

a simple conflict model is essentially useless for penetrating beneath the

surface to the profound intellectual, scientific, theological, cultural, professional,

and personal issues intertwined in this famous episode. It is

historically quite na¨ıve to criticize Galileo’s opponents for failing to accept

his theory:

The new science, which today pervades our entire life, was just emerging, and

very few were able to realize what was happening at the time. Most people were

not ready to abandon cherished traditional ideas for daring hypotheses that had

yet to be proved. (Artigas, 2003:ix)

Galileo in fact in his lifetime did not find the proof he needed to demonstrate

conclusively that the earth revolved around the sun. Furthermore,

incomprehensible though it may be to us now that the Catholic Church

should have possessed any authority to suppress discussion of a scientific

theory, we must bear in mind the role the Church had played for a

thousand years after the fall of the Roman Empire in keeping intellectual

culture alive in Christendom. As founder and supporter of institutions of

higher learning, and as interpreter of the canon of scripture that Christians

regarded as vital to their salvation, churchmen took seriously their

responsibility to protect the faithful by guarding the deposit of faith. In

1600 the medieval vision of the unity of truth was alive and well, and truth

in astronomy was quite relevant to truth in theology.