

## CHAPTER 1



# The Center of the World

In the year 999 two young men living over 250 miles apart, in present-day Uzbekistan and Turkmenistan, entered into a correspondence. They could have sent their messages by pigeon, as was often done then, but the letters were all too long and hence too heavy. The exchange opened when the older of the two—he was twenty-eight—sent his eighteen-year-old acquaintance a list of questions on diverse subjects pertaining to science and philosophy. Nearly all his questions still resonate strongly today. This opened a round of verbal jousting that, through at least four long messages on each side, reads like a scholarly feud waged today on the Internet.

Are there other solar systems out there among the stars, they asked, or are we alone in the universe? Six hundred years later, Giordano Bruno (1548–1600) was burned at the stake for championing the plurality of worlds (the actual charge was pantheism), but to these two men it seemed clear that we are not alone; unique, probably, but not alone. They also asked if the earth had been created whole and complete, or if it had evolved over time. Here they accepted the notion of Creation but emphatically agreed that the earth had undergone profound changes since then. This blunt affirmation of geological evolution was as heretical to the Muslim faith they both professed as it would have been to medieval Christianity. This bothered one of the two young scientists but not the other, so the first—Ibn Sina—hastened to add an intricate corrective that would be more theologically acceptable. But at bottom both anticipated evolutionary geology and even key points of Darwinism by eight centuries.

Few exchanges in the history of science have leaped so boldly into the future as this one, which occurred a thousand years ago in a region now often dismissed as a backwater and valued mainly for its natural resources, not its intellectual achievements. We know of it because copies

survived in manuscript and were published almost a millennium later. Twenty-eight-year-old Abu Rayhan al-Biruni, or simply Biruni (973–1048), hailed from near the Aral Sea and went on to distinguish himself in geography, mathematics, trigonometry, comparative religion, astronomy, physics, geology, psychology, mineralogy, and pharmacology. His younger counterpart, Abu Ali al-Husayn ibn Sina, or just Ibn Sina (ca. 980–1037), grew up in the stately city of Bukhara, the great seat of learning in what is now Uzbekistan. He was to make his mark in medicine, philosophy, physics, chemistry, astronomy, theology, clinical pharmacology, physiology, ethics, and music theory. When eventually Ibn Sina's magisterial *Canon of Medicine* was translated into Latin, it triggered the start of modern medicine in the West and became its Bible: a dozen editions were printed before 1500. Indians used Ibn Sina's *Canon* to develop a whole school of medicine that continues today. Many regard Biruni and Ibn Sina together as the greatest scientific minds between antiquity and the Renaissance, if not the modern age.

In due course it will be necessary to return to this correspondence, which left a residue of bad blood between the two giants. But one detail concerning it warrants particular note. At one point Ibn Sina threateningly reported that he would check Biruni's claims with authorities elsewhere to see if they concurred or not. This was a pathbreaking acknowledgment of the existence of separate fields of knowledge, each with its own body of expertise, and that he, as a philosopher and medical expert, was not necessarily qualified to pass judgment on every field. No less important, he was demanding what today we would call peer review—a clear sign of the existence of a large, competent, and interconnected community of scientists and thinkers. Ibn Sina and Biruni were by no means alone in their scientific passions. Both had honed their skills at intellectual jousting with learned colleagues. This imparted a direct and feisty tone to their exchange, which was festooned with frequent charges like “How dare you . . . ?” But neither side stooped to appeal to authority. Evidence, not authority, is what counted.

It was precisely the authority of one writer, Aristotle, that was most at issue throughout the debate. Syrian Christians in Baghdad had only recently translated his *On the Heavens* into Arabic. Both correspondents had read the translation and were now arguing over whether the observable evidence proved or challenged its claims. It fell to Biruni to point

out the discrepancies between Aristotle's observations and his own. Far from brushing these concerns aside, Ibn Sina tried to account for them within the framework of Aristotelian theory, even as he showed himself open to questioning it.

Both Biruni and Ibn Sina were, in fact, engaged in the very essence of scientific discovery. As Thomas Kuhn pointed out in his magisterial analysis *The Structure of Scientific Revolutions*, scientific breakthroughs are rarely, if ever, a matter of "Eureka!" moments. Rather, Kuhn explained, science is a cumulative process, in which discrepancies between observed reality and accepted theory (what he famously called the "paradigm") slowly pile up. Breakthroughs occur when the accumulation of such discrepancies or "anomalies" leads to the development of a new theory or paradigm. Under the new paradigm, what had formerly been considered anomalous becomes what is expected. Ibn Sina and Biruni were identifying, sifting, and testing anomalies. Their efforts, and those of scores of their colleagues in Central Asia, led directly to the great breakthroughs that occurred much later, and they were an essential part of the process that created those breakthroughs. Medieval Central Asians produced more than a few genuine breakthroughs of their own. But in looking for achievements by these scientists and scholars, we should be equally attuned to this science-making process, at which they were masters, and not just to their "Eureka!" moments.

What is most astonishing about our correspondents is that they were but two—admittedly a very distinguished two—of a pleiad of great scientists and thinkers who worked in the region a millennium ago. Many other instances of learned exchanges involving Central Asians could be cited. Some were friendly and even fraternal: collaborative research was by no means unknown, especially in astronomy and geography, where teams of a dozen or more investigators were assembled. Some collaborations lasted a lifetime. Others were filled with abuse and nasty ad hominem attacks. But whatever the tone, across Central Asia there existed hundreds of learned people who delighted in disputations such as that between Ibn Sina and Biruni, and who expected them to be resolved, so far as possible, on the basis of reason.

This phalanx of scientists and thinkers did not work in a vacuum. Philosophers and religious scholars fleshed out the implications of the latest ideas, sometimes cheering on the innovators and at other times digging

in their heels against them. Rigorous and demanding, these learned men continually asked not only what could be known through reason but also what could not. It was an intellectual and philosophical free-for-all. Adding yet more yeast to the environment was a bevy of talented poets, musicians, and artists, who were creating immortal works at the same time and in the same places. No less than the scientists and scholars, these creative folk left masterpieces that are still revered and admired today.

This was truly an Age of Enlightenment, several centuries of cultural flowering during which Central Asia was the intellectual hub of the world. India, China, the Middle East, and Europe all boasted rich traditions in the realm of ideas, but during the four or five centuries around AD 1000 it was Central Asia, the one world region that touched all these other centers, that surged to the fore. It bridged time as well as geography, in the process becoming the great link between antiquity and the modern world. To a far greater extent than today's Europeans, Chinese, Indians, or Middle Easterners realize, they are all the heirs of the remarkable cultural and intellectual effervescence in Central Asia that peaked in the era of Ibn Sina and Biruni.

## TIME AND PLACE

Neither the beginning nor the end of this great era of creativity can be fixed precisely in time. It is customary to link its beginning with the Arab conquest of the region, which began in AD 670 but was not really completed until 750. It would be more accurate to date the start of Central Asia's Age of Enlightenment to 750, when forces based in Central Asia overwhelmed the Arabs and their Umayyad Caliphate in Damascus and established a new capital at Baghdad. This event, followed by the installation in 819 of a caliph whose power base was in Central Asia, was akin to a reconquest of the Islamic world from the East. As such, it released enormous cultural energies.

Where did these energies come from? We know disappointingly few details of the intellectual life of pre-Islamic Central Asia. But the fragmentary evidence all points in one direction: that Central Asia entered its golden age with a rich accumulation of cultural and intellectual experience in both the secular and religious spheres. As we shall see, the process of Islamization in the region proceeded very slowly, with many

other intellectual traditions thriving side-by-side with Islamic thought down to the year 1000 and beyond. This allowed ample time for cross-fertilization in every direction.

There is no more vexing question regarding the flowering of intellectual and cultural life in the era of Ibn Sina and Biruni than the date of its end. The most commonly accepted terminus point is the Mongol invasion, which Chinggis Khan launched in the spring of 1219. But this turns out to be both too early and too late. It is too early because of the several bursts of cultural brilliance that occurred thereafter; and it is too late because the cultural and religious crisis that threw the entire enterprise of rational enquiry, logic, and Muslim humanism into question occurred over a century prior to the Mongol invasion, when a Central Asian theologian named Ghazali placed strict limits on the exercise of logic and reason, demolished received assumptions about cause and effect, and ruthlessly attacked what he considered “the incoherence of the philosophers.”<sup>1</sup> That he himself was at the same time a subtle and nuanced thinker and a genuine champion of the life of piety made his attack all the more effective.

Taking these reservations into account, it is fair to fix the start and finish of this great intellectual effervescence as 750 and 1150, with important developments occurring both prior to this period and thereafter, but of a different scale and character.

It is important also to fix the geography of this cultural flowering. This, too, turns out to be no easy matter. Those who look at the region through the lens of Arabic religious and political history see Central Asia as nothing more than a vague “Islamic East” that starts somewhere in eastern Iran and fades into nothingness the further east, or south, one goes.<sup>2</sup> This approach defines most scholarship that has arisen in the Mediterranean world, whether Arabic or European, and has spread from there to other parts of the globe. Champions of the approach now write of the existence in Central Asia of “a network of cities and their hinterlands”<sup>3</sup> but do not acknowledge a broader identity that might set off those cities and their hinterlands from other settled zones further west.

Meanwhile, during three and a half generations of Soviet rule we became accustomed to think of the region as a Middle (*Srednaia*) Asia that included only Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, that is, the five former Soviet republics that became independent states in 1991–1992. But over the previous two thousand years, most observers recognized the existence of a much larger cultural

zone at the heart of Asia, one that included what are now the new states of Central Asia, but much more besides.

Afghanistan was considered to be a central component of this broader cultural zone, as were adjacent regions of what is now northern Pakistan. So, too, was the Chinese province of Xinjiang, which remained overwhelmingly Turkic and Muslim down to the Communist takeover in 1949. No less intimate a part of this Central Asian cultural sphere was the ancient region of Khurasan, or “Land of the Rising Sun.” Now reduced to the modest status of a dusty province in the far northeast of Iran, Khurasan once embraced large parts of western Afghanistan and southern Turkmenistan as well. Culturally, Khurasan is inseparable from the regions that later came under Soviet rule, from Afghanistan, and from traditional Xinjiang. In spite of differences of language, ethnicity, nationality, and geography, the inhabitants of all these areas belonged to a single, albeit highly pluralistic, cultural zone.

Anyone seeking a simple and uniform explanation for the burst of intellectual life in medieval Central Asia will be confounded by the diversity of land types within the region.<sup>4</sup> A northern band of grassy steppes stretches practically to the Syr Darya; a central band of deserts and irrigated oases extends with interruptions nearly to Afghanistan and then picks up again in Afghanistan’s Helmand Valley. A third band of mountains covers the region’s South, with a single massif jutting northward along what is now China’s western border.

Beyond these radical contrasts, it is worth noting that each geographical zone represents the ultimate of its type globally. The steppes of Kazakhstan are part of the largest grassland on earth; the middle desert zone includes the Taklamakan, a desert so dry that its sands preserve apple cores for three thousand years; while the mountain chains embrace the Pamirs and Karakorams, both of which are far higher than the Alps. One Karakoram peak in Pakistan-ruled Kashmir, K2, is a mere 777 feet shorter than Everest, and it is only one of many neighboring peaks over five miles high, the largest concentration of peaks of this scale on earth.

To put it mildly, this is not a forgiving landscape. The total area of the cultural sphere of “Greater Central Asia”<sup>5</sup> is smaller than the eastern United States or western Europe, and large parts of all three of its constituent zones are nearly uninhabitable. Its three main rivers, the Syr Darya, Amu Darya, and Helmand, were all formerly used for transport,

but none of them provides a direct water route to the outside world. Worse, the open terrain and location of the mountain chains expose the entire region to invasion from outside, which has occurred as frequently as armies from the region have invaded others.

One of the three geographical zones—the irrigated deserts—was host to the greatest amount of intellectual activity, but it did not function in isolation from the other two. Indeed, without the constant economic and social interaction between desert and steppe, the entire intellectual adventure would never have unfolded as it did.

### INTRODUCING THE PLAYERS

Before plunging into the long and winding drama of Central Asia's Age of Enlightenment, let us follow Goethe in his drama *Faust* and allow some of the key players, the dramatis personae, to take an initial bow on stage. Rather than have them come out together, let us summon them according to the fields of learning in which they made their more noteworthy contributions. In doing so, however, two important caveats must be borne in mind.

First, this was an age of polymaths, of individual thinkers who accumulated truly encyclopedic bodies of knowledge and then went on to make original contributions to as many as six or more different fields. Indeed, the very notion of discrete disciplines was alien to their thinking, the product of a later and more specialized age. During the centuries under study, there was a prevailing interest in assembling the full range of known things into encyclopedias and organizing them into rational categories. A similar impulse had led one ancient writer, Pliny the Elder, in AD 77, to pen an encyclopedia, which was followed up by the Sicilian Cassiodorus in the mid-sixth century. But for the sheer number and variety of their products, no one surpassed the Central Asians as encyclopedists. Their passion for producing meticulous compilations and analyses extended to all nature and to human life as well. Indeed, Central Asia's Age of Enlightenment anticipated the eighteenth-century Enlightenment in Europe, when the Frenchman Diderot issued his famous *Encyclopédie* and the Swede Linnaeus organized all plants into neat categories.

The second caveat is that our judgments of individual thinkers and scientists will be deeply distorted by the fact that a mere fraction of their



known writing has come down to us. Whole bodies of works by scientists and thinkers who were considered stars of the intellectual world have been lost or are known only through an occasional quotation buried in the works of others. We know that Ibn Sina wrote over 400 books and treatises ranging in length from a few pages to multiple volumes, but only 240 survive in any form, of which only a fraction have been edited and published. Biruni is known to have written 180 works, of which only 22 have survived.<sup>6</sup> The problem does not end there. Large numbers of surviving manuscripts still languish in archives, having never been transcribed, edited, and issued in the original Arabic or Persian, let alone translated into today's scientific languages. Judging by the quality of works that have recently seen the light of day, what remains to be edited and translated is no less important than what has been. Only thirteen works by Biruni have been published, 7 percent of his total oeuvre. Dedicated scholars in many countries have made progress at this immense task, but much remains to be done. And so we are constrained by what by chance has survived and appeared in modern editions.

Let us, then, proceed with our brief introductions. In astronomy, we might start with Khwarazmi, from what is now western Uzbekistan, who was among several Central Asian astronomers who organized a major project to measure the length of a terrestrial degree and developed tables for constructing horizontal sundials that were precisely adjusted to latitude.<sup>7</sup> He also devised an instrument that used sine quadrants to derive numerical solutions to problems of spherical astronomy. Biruni's astronomical research led him to conclude that planetary orbits could be elliptical, not circular, and that the sun's apogee varied in predictable ways. In a bold move against Aristotle and his followers who used "natural philosophy" to solve scientific problems, he argued that such issues could be resolved only by mathematical astronomy. Recently the existence of elliptical orbits among planets circulating other stars in our galaxy has drastically shrunk the estimated number of such "exoplanets" that might be inhabitable. Biruni's teacher and close friend, Abu Nasr Mansur Iraq, was said to have been the "second after Ptolemy," but next to nothing of his voluminous astronomical work survives.

Khujandi, from northwest Tajikistan, built a large mural sextant and produced several measurements of unprecedented precision on the obliquity of the ecliptic, such as the angle formed by the plane that is



perpendicular to Earth's axis, and the angle in which Earth and the sun moved in relation to each other. Of course, he still assumed that the sun orbits Earth, but his measurements represented an important step forward in the study of this relationship. He also developed an instrument that applied spherical trigonometry to astronomical problems.

Farghani, from the Ferghana Valley in present-day Uzbekistan, wrote a treatise on the main astronomical instrument of the Middle Ages, the astrolabe, that later gained a wide readership in Europe. He also penned a study on astronomy that became the best-known "Arab" work in that field in Europe. Among his many readers was Christopher Columbus, who, working half a millennium after Farghani, seized on the Central Asian's calculation of a degree of Earth's circumference as  $56 \frac{2}{3}$  miles. Farghani's calculation was in Arab miles, however, while Columbus, eager to reduce the distance between Europe and China to the greatest extent possible, jumped to the conclusion that he had meant Roman miles. This, along with several other computational errors, reduced the distance Columbus would have to travel by 25 percent. Because of this miscalculation, the "Admiral of the Ocean Sea" fully expected to find "Cipango," or Japan, at about the same meridian as the Virgin Islands. The shorter measurement was woefully inaccurate, but it conveniently provided Columbus with a powerful argument when he began to present his case for funding to the king of Portugal, and later to the Spanish court.<sup>8</sup>

Several Central Asians prepared astronomical tables of stunning accuracy. Ulughbeg, a ruler in Samarkand who pursued a lifelong passion for astronomy, determined the length of the sidereal year more accurately than Copernicus and measured Earth's axial tilt so precisely that his figure is still accepted today. A student of Ulughbeg's, Ali Kushji, considered that the motion of comets provided empirical evidence for the possibility of Earth's rotation and was the first to declare astronomy's full independence from "natural philosophy."

In mathematics, Khwarazmi was the first to elaborate a theory of equations solvable through radicals, which can be applied to the solution of a variety of arithmetical and geometrical problems. The result was a book, *Algebra*, that gave its name to the field; the term *algorithm* is a corrupted form of his own name. Khwarazmi advanced the field of spherical astronomy and did more than anyone else to popularize the decimal system that had been invented in India. His friend Marwazi from Merv in

Turkmenistan did pioneering work on tangents and cotangents. Biruni was one of several Central Asians who championed the importation of the concepts of zero and negative numbers from India and broke new ground in their use. Several Central Asians competed for priority in the development of trigonometry and its establishment as an independent field, which was to be reinvented in Italy in the seventeenth century.<sup>9</sup>

The construction by poet Omar Khayyam (yes, the poet!) of a geometrical theory of cubic equations was a genuine breakthrough, as was his extension of arithmetical language to ratios. Khayyam was the first to identify and classify the fourteen types of third-degree equations and to propose geometric proofs for many that had previously confounded experts. He was also among the first, if not *the* first, to accept irrational numbers as numbers. In attempting to prove Euclid's axiom that parallel lines cannot meet, he produced a new theory of parallels. Two Soviet historians of science concluded that some of the propositions derived by Khayyam in his theory of parallels were "essentially the same as the first theorems of the non-Euclidean geometries of Lobachevski and Riemann,"<sup>10</sup> both of whom, it should be noted, lived seven hundred years after Khayyam.

In optics, Ibn Sahl from what is now the border area between Turkmenistan and Iran wrote an important treatise on the use of curved mirrors to focus light. Building on the work of his predecessors, he also solved the problem of using lenses to focus light to a point, which no ancient scientist had accurately addressed. In the process he discovered the law of refraction. In medicine, Ibn Sina's *Canon* contains powerful passages on the impact of the environment on health, and also stunningly prescient passages on what we today call preventive medicine. He considered the principles of treatment for hundreds of maladies, including psychosomatic illnesses of all types. Besides Ibn Sina, several other Central Asians wrote massive compendiums of practical and theoretical medicine. One, Central Asia-trained Muhammad ibn Zakariya al-Razi, was the boldest diagnostician and surgeon of the Middle Ages. Pharmacology, too, attracted many pioneering scientists from the region, including some who had no connection with medical practice.<sup>11</sup> In biology, Biruni, in a book on India, directly anticipated Malthus in predicting the proliferation and collapse of species.<sup>12</sup>

The large-scale effort to analyze the medicinal effects of plants was paralleled by research in chemistry to identify the hardness and other

properties of minerals. Building on the work of Archimedes, Biruni was a leader in this. He was also the first anywhere to measure the hardness of minerals and their specific gravity. A Persian disciple of Central Asian scientists was the first to identify reverse reactions. Large-scale mining throughout the region also encouraged pioneering research in chemistry, which was successfully pursued by numerous regional investigators, whose existence is known only from occasional mentions in the literature.

Geology and the earth sciences also advanced strongly during these marvelous centuries, with Ibn Sina and Biruni being credited with the first theory of sediments, a theory on the formation of mountain ranges that has gained acceptance only in recent centuries, and important hypotheses on the process by which continents emerged from seabeds.

Geography also flourished, with Mahmud Kashgari's issuing of the earliest map showing Japan, and numerous astronomers and experts on trigonometry combining their skills to pinpoint the latitude and longitudes of hundreds of locations from India to the Mediterranean. A whole school of geographers was born when a researcher at the Afghan city of Balkh came up with an innovative way of mapping the earth based on the application of spherical geometry and mathematics.

Beyond doubt, the era's greatest achievement in geography was the work of our friend Biruni, who used astronomical data to postulate the existence of an inhabited land mass somewhere between the Atlantic and Pacific Oceans. The astonishing process, which led to this earliest "discovery of America," is described in detail in chapter 11. It represents the triumph of the mathematician and geometrician over the metaphysicians and theologians. Equally, it demonstrated that a cloistered scientist could be as bold an explorer as an intrepid mariner who hoped against hope that land would appear on the horizon, that rational analysis could be even more effective as a tool for discovery than seafaring.

Central Asia produced many talented historians. Beyhaqi from Khurasan wrote a highly intelligent history of one the many mega-states to arise in the region, that of Mahmud of Ghazni, whose realm stretched from India to the Middle East. And later a descendant of Tamerlane (Timur), Babur, wrote an extraordinary history of his own rise in Central Asia, his conquest and rule in Afghanistan, and his eventual creation of the Mughal empire in India. But the main focus of most Central

Asian historians was, tellingly, on their native cities, where cultural life thrived, and on the great leaders who changed the fate of the region. Consequently it fell to a Persian from Hamadan, beyond the borders of Central Asia, Rashid al-Din, to write the world's first universal history.<sup>13</sup>

Central Asia's most astute student of societies was Biruni, who founded the field of anthropology and pioneered the field of intercultural studies and comparative religion.<sup>14</sup> It is no exaggeration to say that Biruni was the greatest social scientist between Thucydides and modern times. By comparison, Hugo Grotius (1583–1645), Thomas Hobbes (1588–1679), Samuel von Pufendorf (1632–1694), and John Locke (1632–1704) were all more interested in theorizing about the nature of society than in studying it as it actually is. Mahmud of Kashgar, now in Xinjiang, China, was an accomplished Turkologist and ethnographer who virtually invented the field of comparative linguistics, while Yusuf Balasaguni, from Balasgun in present-day Kyrgyzstan, and Nizam al-Mulk, from Nishapur in Khurasan, were adept at combining political reality and philosophic principles in their manuals for leaders.<sup>15</sup> The polymath Farabi, from Otrar in southern Kazakhstan, penned an important theoretical treatise on the ideal city, in which he warned that any society that fails to make use of the thinkers in its midst has only itself to blame.<sup>16</sup>

One of the glories of the Central Asian intellect was philosophy, which natives of the region pursued with an innovating passion that far surpassed that of everyone else in their era; their writings were to exercise a decisive influence on Muslims everywhere and on the Christian West as well. Cosmopolitan, individualistic, and profoundly humanistic, Central Asian philosophy was also, in the eyes of its critics, skeptical, irreverent, and profane. It reached its apogee with Farabi, who was called “the second teacher” after Aristotle and who, with Ibn Sina, achieved what many considered to be a harmonious blend of reason and revelation, logic and metaphysics, Aristotle and the Neoplatonists.<sup>17</sup> The great German scholar Adam Mez declared that the humanism of the European Renaissance would have been impossible without this earlier explosion of philosophical inquiry in Central Asia.<sup>18</sup>

Logic, largely ignored today, was an essential tool of all those who fought on the intellectual barricades in the Middle Ages. Thanks to Farabi and other Central Asian logicians, its austere principles became established, or reestablished, as a prime tool for attaining truth. Ibn Sina

and others proceeded to show how logic could be applied in the mathematical sciences as well. In the West, meanwhile, Aristotelian logic lost out to Scholasticism.

Libraries, the essential tool of all these scientists and scholars, abounded in Central Asia. Ibn Sina's work took off when he gained access to the royal library at Bukhara, and the Middle Eastern scholar Yaqt traveled halfway across Eurasia to avail himself of the dozen libraries at Merv, now in Turkmenistan. Other great collections existed at Gurganj in the North, Balkh in the South, Nishapur in the West, and Samarkand. Indeed, it is all but certain that every major Central Asian city at the time boasted one or more libraries, some of them governmental and others private. Central Asians were also among the main users at the caliph's library at Baghdad, which was built up mainly by learned men from the region. The West could also claim libraries by this time, especially after 780, when Charlemagne sent out an appeal for copies of remarkable or rare books,<sup>19</sup> but their number and wealth in classical texts left then incomparably weaker. Nor could the West claim anything to compare with the countless book dealers in every major Central Asian city, or the well-attended auctions of books and manuscripts that attracted well-heeled buyers.

What can be said of these assembled thinkers as a group? Central Asian intellectuals of this golden age affirmed that there are not one but many means of reaching scientific truths, including deduction, logical argumentation, intuition, experimentation, and observation. By so doing, they enormously broadened and deepened the scientific enterprise.<sup>20</sup> Equally important, they held that the rules they set down in each of these areas applied equally to the simple and the bewilderingly complex, to domestic objects and the movement of the heavens. This notion of *universality* has often been seen as a signal achievement of the scientific revolution and the age of Isaac Newton.<sup>21</sup> But it was accepted as a fact by most of the leading figures of Central Asia's Age of Enlightenment.

Theology, too, reached a high peak in Central Asia during the Age of Enlightenment. Ibn Sina was but one of many thinkers from the region who explored the rational basis for religion while acknowledging the mysteries of revelation and faith. Some pushed the first part of this equation, notably the so-called Mutazilites, who favored the most uncompromising application of reason to Muslim theology. While not

founded by Central Asians, this important and controversial school of thought found its most ardent supporters in Central Asia. Beyond these, the region was also home to Hiwi al-Balkhi, Abu Bakr al-Razi, and Ibn al-Rawandi, all outspoken skeptics of religion or outright atheists.

On the other side of the equation, those who would found their faith on revelation alone or the words of the Prophet that had been passed down through the centuries also had their most effective champions in Central Asia. Islam's second most hallowed book, the collected Hadiths, or Sayings, of the Prophet Muhammad, was the work of a Central Asian, Bukhari; beyond this, of the six collections of the Hadiths considered canonic by Sunni Muslims (and most Shiites), fully five were the work of Central Asians.<sup>22</sup> One of the four schools of Sunni Islamic jurisprudence was founded by a Central Asian, and a second found its most congenial home there. Also, the greatest official defender of Sunni orthodoxy was Nizam al-Mulk from Khurasan, who also gave the madrasa the purpose and form it retains today. In sharp contrast to both the rationalists and the traditionalists were those who adhered to the mystical current known as Sufism. This movement, too, found early expression and attained its greatest influence in Central Asia, where several of the major worldwide Sufi orders were founded by the likes of Najmuddin Kubra, Ahmad Yasawi, and Bahaudin al-Din Naqshband Bukhari.

The Age of Enlightenment produced consummate achievements in the arts and letters. Sufi poets like Rumi from Balkh in Afghanistan and Omar Khayyam have large audiences worldwide even today. Earlier poets like Rudaki and Asjadi stand at the source of the great Persian literary tradition. Ferdowsi, whose immense panorama of the civilization of Iranic peoples, the *Shahnameh*, set a world standard for other national epics, was a native of Khorasan, and most of his epic was set in Central Asia, not the lands that now constitute the state of Iran. Nearly all the scientists, including Ibn Sina, wrote at least part of their works in verse.

The building arts and painting flourished. The stunning multicolored minaret of baked brick constructed in 1108–1109 at Jarkurgan, Uzbekistan, still stands, as does the now extensively restored tomb of the Seljuk sultan Sanjar, designed in 1157. Both were designed by architects from Sarakhs on the Turkmenistan-Iran border, Ali of Sarakhs and

Muhammad Ibn Atsiz al-Sarakhsi. Roman architects had employed a double dome at the Pantheon in the early second century AD, but knowledge of this innovative technique seems to have died out soon thereafter. However, it emerged again at the immense eleventh-century tomb of Sanjar at Merv and at smaller structures in Khurasan. Eventually the technique found its way across Iran and the Middle East to Brunelleschi's dome at the Duomo in Florence, and other double domes across Europe and the Americas. Similarly, the diamond pattern in the brickwork on the exterior of the twelfth-century Kalyan minaret in Bukhara was later imitated on the walls of the Doge's Palace in Venice.<sup>23</sup>

Painting had deep roots in pre-Muslim cultures across the region. Despite Muslim prohibitions against depicting the human form, it lived on in Muslim times and even staged a great revival at the end of our period. Kamoliddin Bihzad from Herat in Afghanistan stands as one of the great painters of the late Middle Ages, and his exquisite book illustrations and miniatures are now recognized as one of the highest achievement of Islamic art. Meanwhile, craftspeople do not often sign their products, but in Central Asia many silversmiths and casters of bronze did so, revealing their justified pride in even their most utilitarian wares. Finely woven fabrics from the region were so prized in the West that they found their way into the treasuries of many European cathedrals, where they remain today.

The people who made these and other seminal contributions to science, thought, and the arts were not anonymous toilers or withdrawn ascetics. On the contrary, they were activists who traveled widely, wheeled and dealt with patrons, and engaged in sharp polemics with colleagues. In spite of Muslim dictates to the contrary, many, if not most, drank wine, and one poet, Anvari, was so earthy that a modern Muslim editor declared that "a large part of his writings are unfit for translation."<sup>24</sup> In short, they were energetic, worldly, and resourceful—the kind of people who naturally impose their personalities on their work and those around them.

The great Swiss historian Jacob Burckhardt argued that what he called "the discovery of the individual" was the very hallmark of the Italian Renaissance, separating that dynamic era from the Middle Ages that had gone before. Even if one modifies this to acknowledge the Greeks and



Romans, the Central Asian thinkers and artists assembled on the stage before us must still be credited with the same discovery, or rediscovery, half a millennium before the age of da Vinci. This may have been their greatest innovation of all.<sup>25</sup>

## THE INTELLECTUAL CLASS

Even this superficial and incomplete list of names and achievements confirms that these medieval Central Asians were not mere transmitters of the achievements of the ancient Greek past but were also, in diverse fields, the creators of important new knowledge. The scale and range of their achievement prompts one to ask, “Who were these people?” They fit no single stereotype, but a few generalizations are in order, beginning with their ethnic identity.

Many, if not most, Western writings down to the present day identify Ibn Sina, Biruni, Khwarazmi, Farabi, Ghazali, and the others as Arabs. This important misidentification is to be found even in some of the most authoritative European and American histories of philosophy and science.<sup>26</sup> It is true that most, but not all, of Central Asia’s thinkers in this era *wrote* in Arabic. Indeed, the adoption of Arabic as a single lingua franca for intellectual interchange throughout the Islamic world was of huge importance to the creation of an international marketplace of ideas. The speed with which the Arabic language absorbed unfamiliar concepts and adapted to the needs of scientific and technical communication is impressive. But it was Central Asians, by their prolific writings, who were at the forefront of this process of enriching Arabic with new concepts and terms. This occurred at almost exactly the same time that Latin in the West was shrinking from the status of a universal tongue to the language mainly of religion and ideas. As the French scholar Jacques Boussard put it, “Latin gradually became deformed and simplified, and finally gave place to a new and extremely rough and uncivilized language—Vulgar Latin.”<sup>27</sup>

A Central Asian who wrote in Arabic a millennium ago was no more an Arab than a Japanese who writes a book in English is an Englishman. Most of the writers and thinkers mentioned above may have passed their professional lives in an Arabic-speaking professional milieu, but

Arabic was not their native language, nor were they Arabs. As Harvard's Richard N. Frye archly observed, "It is a remarkable fact that, with few exceptions, most Muslim scholars both in the religious and intellectual sciences [were] non-Arabs."<sup>28</sup> When a learned Arab of the eleventh century compiled a list of all the "praiseworthy peoples of the age" who wrote in Arabic, a third of the total of 415 he enumerated were from Central Asia.<sup>29</sup> Of the remaining two-thirds, more than half were Persians from what is now Iran. The hegemony of Central Asians was more overwhelming in the sciences, philosophy, and mathematics, in which fields they constituted up to 90 percent of the total.<sup>30</sup> Most were of some Iranian stock and spoke diverse Iranian languages, but increasing numbers were Turkic as well. Their many native tongues belonged to either the Iranian or the Turkic language groups.

Were they, then, what we think of today as Iranians or Turks? A millennium ago neither Iran nor Turkey existed as a state. Peoples who spoke the diverse languages and dialects belonging to the Iranian and Turkic families of languages were spread over a vast territory that extended far to the east of present-day Iran and, until the eleventh century, did not include any part of what is now Turkey. Modern Turks would have trouble understanding the Turkic languages of tenth-century Central Asia, just as a citizen of Tehran would surely have been unable to comprehend Sogdian, Bactrian, or Khwarazmian, even though they were all Iranian languages. These diverse Iranian and Turkic peoples met and mingled above all on the territory of Greater Central Asia where, from the earliest days, they acquired a pluralistic but very real and distinctive identity of their own.

To distinguish Central Asians of Iranian stock from the inhabitants of what is now Iran, scholars have applied the terms "Persianate" or "Iranic" to the former. The geographical location of Central Asia played a significant role in forging this special identity. Proximity put its inhabitants in direct trade contact with India and China, as well as the Middle East. By contrast, even speakers of Iranian or Turkic languages further west looked mainly to the Middle East, the Caucasus, and Europe.<sup>31</sup> Thus, to speak an Iranian or Turkic language in AD 1000 meant something quite different from what either means today.

From earliest times it was understood that people of Persianate stock in Central Asia were different from Persian speakers in most of what is

now Iran. Herodotus noted that the Persian empire of Darius and Xerxes did not tax people it accepted as “Persian.” But Central Asians whose languages belonged to the Iranian language group were considered sufficiently different that the Persian state taxed them as foreigners.<sup>32</sup> Today the difference between citizens of Iran and speakers of Dari and Tajik in Central Asia is reinforced by the fact that the former are all Shiites, while their Central Asian and Afghan cousins are mainly Sunni. Similarly, Turkic peoples who came as nomads to settle in Central Asia adopted new relationships and patterns of life that distinguished them increasingly from the larger body of Turkic peoples, not to mention those in the remote Altai homeland region of what is now Siberia and East Kazakhstan.

A second common characteristic that was nearly universal among both Persian and Turkic writers and intellectuals is that they were formed mainly by urban environments and spent their careers in cities. Unfortunately, the Central Asian cities in which they lived can scarcely be imagined, let alone seen, today. This is due to the fact that the chief building material across Central Asia was impermanent sun-dried brick, which, like adobe, is cheap and strong but subject to erosion by rain and wind. Nearly all the monumental and more humble buildings that medieval writers amply describe have long since dissolved, leaving only a mound of dirt. Had they been built of stone they would still be standing, with the result that tourists would be flocking to Central Asia and Afghanistan the way they do to Italy or India, where most buildings were of stone. An equally formidable enemy of built structures in Central Asia was earthquakes, which hit with alarming frequency across the length of this seismically active region. Earthquakes devastated the great city of Nishapur twice in one generation (in 1115 and 1145),<sup>33</sup> and even the clever antiseismic techniques devised by Central Asia’s medieval architects and engineers could not prevail when a big one struck.

Thanks to extensive archaeological work in the region, we can now begin to form a picture of the medieval Central Asian city. Like great business centers everywhere, they were hives of industrial and commercial activity, teeming with traders and offering no corners of tranquility and repose. Typically, the great religious scholar Burhan al-Din al-Marghinani did most of his writing not in a rural monastery but at his urban residence only a few paces from the main east-west caravan route through his native city of Marghilan, now in Uzbekistan. Marghilan and other Central

Asian cities exhibited a few of the characteristics of the generic “Islamic city” invented by Western Orientalist scholars, but Central Asian cities were in fact quite distinctive within the Muslim world, in both form and structure. This is not surprising since they had existed for up to three millennia before the Arab armies arrived and had had plenty of time to develop their distinctive spatial planning and architectural styles.

Who paid the intellectuals of medieval Central Asia to sit and think deep thoughts? Biruni believed that kings should do this, “for they alone [can] free the minds of scholars from the daily anxieties for the necessities of life and stimulate their energies to earn more fame and favor, the yearning for which is the pith and marrow of human nature.”<sup>34</sup> A few of the great minds of the era found royal backers, but relations between patron and thinker were rarely tranquil. More often our thinkers failed to find a royal patron or deep-pocketed Mycaenas who could enable them to work in peace. Lacking steady support, such learned men became “wandering scholars,” to cite the title of Helen Waddell’s 1927 book on medieval European lyricists who moved from court to court in search of patronage. Some had worldly skills that they could put to use as administrators: Ibn Sina, whom we met as a precocious scientist and philosopher, enjoyed the patronage of the Samanid dynasty and later served for a few years as what we might call a prime minister to the Buyid ruler Shams al-Dawla. Nizam al-Mulk, author of a famous volume of advice for his prince, occupied the same position in the Seljuk empire and was its most powerful political figure. Still others, among them the Turkic writer Yusuf Balasaguni, wrote fat volumes in the hope that a ruler would “discover” them and reward them with a pension. In Yusuf’s case the support actually materialized. But the great poet Ferdowsi, author of a national epic many times the length of Homer’s *Iliad*, waited a lifetime for his patron to pay him the money he had been promised, and even then it arrived only after his death.

Whether or not things worked out to the thinkers’ satisfaction, the intellectual history of Central Asia is in part a story of patronage, of the rich and powerful who were prepared to spend part of their wealth on the support of science and the arts. Fortunately, over the course of several centuries nearly all rulers in the region, among them several certifiably brutal tyrants, acknowledged that the patronage of wise men was one of the obligations that came with kingship. At its worst, such royal

patronage descended to a type of exhibitionism, with an ambitious ruler convening writers and thinkers in elegant soirees to show off his own wit. Yet there were also royal or aristocratic patrons who truly understood the life of the mind and had a rare ability to identify true talent for their entourages. Their generous financial support, combined with a broad outlook and patience, enabled a few brilliant scientists and thinkers to toil in peace for years, without concern for their daily sustenance—an amazing stroke of good fortune in any society.

Many of these patrons were purely local, the heads of ruling houses or dynasties that held sway in a single city, valley, or district. For support on a larger scale, the intellectuals and artists looked to the rulers of the various empires that claimed control over the territory of Greater Central Asia. Some of these, like the early Kushans, Bactrians, and Khwarazmians, or the later dynasties of Ismail Ibn Ahmad Samani, Mahmud of Ghazni, and Tamerlane (Timur), were locally based. Others, including the Baghdad Caliphate, originated outside the region and by force of arms asserted claims of suzerainty over the local courts and territorial dynasties. Many were ruthless and blood-drenched rulers, but among them were sultans or monarchs who quickly grasped that support for thinkers and artists would glorify their rule and be a source of strength, not weakness.

All the intellectuals listed above, and many more not yet mentioned, are generally grouped under the rubric “Muslim or “Islamic.” Most, but not all, were indeed adherents of Islam, and some were deeply devout. But is this a defining feature of their identity, or merely a convenient label? Going deeper, were they orthodox Sunni, Shiites, heterodox, or, like many during the eighteenth-century Enlightenment, mere deists who acknowledged God as a First Cause but not necessarily as a presence in the material world? We know that Islamization in Central Asia proceeded slowly over some three hundred years, during which many other religious and intellectual currents continued to flourish. Is it therefore accurate to characterize all art from this time and place as “Islamic,” or is the notion of “Islamic art,” as a reviewer of a major London show argued in the *New York Times*, a “groundless myth” perpetrated by Western orientalisks?<sup>35</sup> What, if any, was the influence of other faiths, and what about the skeptics, freethinkers, agnostics, and atheists among the scientists and philosophers?<sup>36</sup>

### THREE QUESTIONS: EASY TO POSE, DIFFICULT TO ANSWER

These and many other questions inevitably arise when one sets out to identify those creative thinkers who, over several centuries, made Central Asia the center of the intellectual world and whose work profoundly affected science and civilization in both the East and the West. Rather than allow such queries to proliferate indefinitely, and thereby lose the connecting thread in a welter of details, it is useful to reduce them to three. This turns out to be quite simple. First, what did Central Asian scientists, philosophers, and other thinkers achieve during these centuries? Second, why did this happen? And third, what became of this fecund and tumultuous movement of ideas?

Each of these questions poses a serious challenge. The first leads into a dizzying array of fields and disciplines, from astronomy to epistemology and to Muslim theology. Not all these fields and disciplines flowered equally or at the same time. By what standard should advances in one be weighed against stagnation, or worse, in another? And should advances be evaluated in terms of their long-term impact or on the basis of their influence on the thought of contemporaries? The latter approach, which is entirely legitimate, would cause us to devote the same amount of attention to Abu Mashar al-Balkhi, who was the most renowned astrologer in the Muslim world and venerated equally in the West, as to an astronomer like Khujandi or Farghani, whose accomplishments are still recognized today.

The second question—why did it happen?—is yet more demanding, for it plunges us into the fundamental questions of causation in human history. Tolstoy, in the second epilogue to his novel *War and Peace*, ventured onto this dangerous territory in his effort to account for Napoleon's actions at the Battle of Borodino in 1812. Yet it is a far simpler matter to account for a single European battle in comparatively recent times than to elucidate the causes of an intellectual and cultural effervescence at a far-off time and place.

Why, we might equally ask, did Periclean Athens achieve such incandescent intellectual vigor, or Renaissance Florence, Restoration London, Classical Weimar, Nara in its golden age, or, for that matter, Concord, Massachusetts, in the era of Emerson, Thoreau, and the Alcotts? Underlying each of these specific instances of cultural greatness—and Central

Asia's Age of Enlightenment as well—are timeless imponderables about the sources of human creativity and the motives for human action. One might as well ask what it is that brings out the inquiring and thoughtful side of each of us today!

The third question—what happened to it?—is particularly compelling, for it bears directly on current events in the region and in the world. Thoughtful men and women within the region ask this of each other, and analysts further afield raise it whenever discussion turns to the arc of lands extending from Central Asia westward to the Middle East. The same question has been asked concerning periods of brilliance at other times and in other places. This is the simple question that impelled Edward Gibbon to pen six volumes on *The History of the Decline and Fall of the Roman Empire*. Not shy in his judgments, Gibbon advanced so many brilliant hypotheses, ranging from the erosion of public morals, the decay of specific military units, and the influence of other-worldly Christianity, that one comes away from his tomes as from a feast with six main courses. The late Joseph Needham and his colleagues produced an exhaustive twenty-six-volume masterpiece on *Science and Civilization in China* and found themselves compelled to add a final volume of *General Conclusions and Reflections* that is more reflection than conclusion. Having so deeply considered the developments that caused China's rich tradition in science and technology to wane, this inquiry is justly called "the Needham Question." It remains open.

## ROADS NOT TAKEN

These, then, are the great questions to which this work is dedicated, and which this or any other attempt to delve into the Age of Enlightenment that occurred in Greater Central Asia must eventually address. Firm answers may prove elusive. But the proliferation of questions within questions poses a challenge of its own. The danger is that the inquiry will come to resemble a prickly bush that has not been pruned, with many thorny branches and twigs but no overall shape. Lest the inquiry have so many foci that, like a kaleidoscope, it leaves us with nothing more than a memory of infinite colors and shapes, it is necessary to indicate what will *not* be included in what follows.





Figure 1.1. Graceful musicians from a Kushan-era limestone frieze, Airtam, Uzbekistan (first to third centuries). Central Asian musicians pioneered plucked string instruments and invented the bow. ■ Airtam Frieze-Musician, detail of the Airtam Frieze, 1st c., limestone. From Bactria, the Kushan period, inv. no. CA 3199. The State Hermitage Museum, St. Petersburg. Photograph © The State Hermitage Museum. Photo by Alexander Lavrentiev.

First, there is the matter of music, which, along with poetry, was considered the king of the arts. In few areas did Central Asians sweep more dramatically beyond their Hellenistic Greek mentors and blaze the trail for later Europeans than in music making and especially in theorizing about music.<sup>37</sup> Long before the Islamic era, Central Asians invented the bow as a means of eliciting sound from a string; thanks to this invention, which quickly spread to China, India, and the West, Central Asia can be considered the genetic homeland of the violin.<sup>38</sup> Rudaki, a poet of timeless appeal, was a brilliant musician. The philosopher Farabi, who was himself a talented lutenist, was the author of *The Great Book on Music*, generally considered the premier theoretical work on music from the medieval period, a work that, in Latin translation, deeply influenced European thinking about music.<sup>39</sup> Other Central Asians built on Farabi's foundation. Yet the absence, until the seventeenth century, of a systematic system of notation prevents us from hearing the music of Farabi's era. Worse, the psychological gulf between Central Asian music, with its modes and semitones, and the Western twelve-tone scale thwarts comprehension and real appreciation, even if it is heard. For this reason, music does not play the role it should in what follows.

Popular culture, too, finds little place in the following pages. The same literature that produced treatises of philosophy and the sciences also gave rise to the writings of storytellers and exorcists, jugglers and magicians, not to mention whole collections of anecdotes, incantations, tricks and talismans, and books composed on everything from freckles to twitching. There were even compendiums of sexually titillating tales drawn from Persian, Indian, Greek, and Arabic books, not to mention both large and small books on *The Capable Woman*, concubines, and homosexuals.<sup>40</sup> Yet such manifestations of popular culture seem rarely to have affected the high culture that is the subject of this study,<sup>41</sup> although further investigation could well change this judgment. The one clear instance of popular values being the driver for an intellectual shift is the case of Sufism, the mystical and ecstatic form of Islam that seeks to strip away all worldly concerns to put the believer into direct communion with God. In this case a movement “from below” eventually forced itself onto the attention of the intellectuals, who responded in ways that changed the religion of Islam forever and affected Christianity as well.

Some readers may wish that the following exposition dealt more fully with the culture of the many nomadic peoples, whether Iranian, Mongol, or Turkic, who swept through the territory of Central Asia from the first millennium BC through the fifteenth century AD. The Turkic group of people who gained suzerainty over Central Asia in the pre-Islamic sixth century were so serious about protecting their realm that they entered into formal diplomatic contact with both Byzantium and China. Other nomadic empires embraced similarly huge territories and diverse peoples, the management of which required constant attention and immense expenditures of energy. Also, it is no slight to say that the nomads’ intellectual faculties found expression in the elaboration of their complex cosmological systems and beliefs, and their expression in song and poetry, rather than in the fine points of Aristotelian epistemology. Increasingly, though, these communities produced intellectuals who participated in the ecumenical and multicultural life of the mind that prevailed in the region’s cities and who made their own contribution to that discourse. But the many intriguing questions regarding the religion, worldview, social outlook, and literary monuments of the nomads range beyond the bounds of our inquiry, which will be defined in terms of formal texts and deliberate works of art produced in the settled cities.

Space does not permit a more detailed analysis of all the complex cultural and intellectual interactions between Central Asia and the major cultures that lay just beyond its southern, southwestern, and southeastern borders. Beyond doubt, some of the most persistent and productive stimuli to fresh thinking were the new ideas that flowed in from India, China, and the Middle East from the fifth century BC through the era of Tamerlane (Timur) in the fifteenth century AD. Some, like the concept of zero from India, had to do with mathematics or science; others, such as the wavelike ornamentation that artists in Herat, Afghanistan, borrowed from Chinese colleagues in the fifteenth century, were in the aesthetic realm. The subject is the more intriguing because such influences operated in both directions. Edward H. Schafer devoted a whole book to enumerating the exotic products from Central Asia that lent color and excitement to the court of Tang China.<sup>42</sup>

The subject of intellectual and cultural interchange with these great civilizations, and the balance between them, is important to our inquiry, for it goes far toward defining the special character of Central Asian life and thought. But its dimensions are so huge that it can only be dealt with telegraphically, rather than exhaustively. What can, and will, be considered is how Central Asians processed those ideas from abroad and whether, and how, they may have reworked some of them in the process.

We will also treat only superficially the many ways in which specific works and ideas of Central Asian thinkers found audiences in both the East and West, mainly through translations into Hindi, Chinese, or Latin. Much study has been devoted to this important question, but the work has barely begun. But it is worth noting that the distinguished art historian Oleg Grabar and his colleagues assert that during the period of flowering, culture flowed from East to West, that is, from Central Asia into the rest of the Islamic and Mediterranean worlds, not vice versa.<sup>43</sup> Leaving aside the immense impact of the Central Asians on Islamic thinkers from elsewhere—figures like Averroes, Ibn Khaldun, and scores of others—the subject of their profound influence on the Christian West, including everyone from Abelard to Thomas Aquinas and Dante, would alone fill many volumes. Joseph Needham went further than anyone in documenting their influence in China, but the analogous research on India remains at a preliminary stage, even though many thinkers from Central Asia actually lived and worked there.

Other readers, reviewing the parade of male thinkers presented below, may well ask “Where are the women?” Where is the Central Asian woman comparable to Hildegard of Bingen, the learned and capable abbess of a large German convent in the twelfth century and a composer of genius, or Hrroswitha of Gandersheim, a Benedictine canoness who in the tenth century wrote six plays in the classical style, thereby anticipating the revival of theater by two centuries?<sup>44</sup> To be sure, there is Rabia of Balkh, the cosmopolitan metropolis in north-central Afghanistan, whose ardent and subtle poetry earned her the admiration of all.<sup>45</sup> But one looks in vain for females from the region who left significant legacies in the realm of systematic thought. The closest any came to this were the later mystic religious poets who, in their quatrains, explored the Sufi experience.<sup>46</sup>

Some have traced this situation to the status of women in Islamic societies and, presumably, to their status in pre-Muslim society as well. Manuela Marín, writing on “Women, Gender, and Sexuality” in early Muslim societies, concluded that “It was considered dangerous for women to write because they could use this skill for unlawful communication with men.”<sup>47</sup> This led to a situation in which the scholarly vocation came to be exclusively male, as were the ranks of those who interpreted Islamic law.

Of course, women could own and inherit property and in fact often served within the family as bankers. The fact that Zoroastrian inheritance law, like Jewish law, was far more favorable to women than the Islamic law that replaced it may also have strengthened the role of Central Asian women in areas other than learning and scholarship.<sup>48</sup> Women were certainly prominent behind the scenes in Central Asian politics. Thus when Arab armies arrived at the gates of Samarkand bearing their new religion and seeking plunder, they encountered a steel-willed local woman who was ruling on behalf of her young son.<sup>49</sup> During the tenth century, when the Samanid dynasty in Bukhara reached its intellectual zenith, another woman ruled quite successfully as a wife of the former ruler. In a Central Asian city further west a widowed queen, known ironically, as “The Lady,” faced the ruthless Mahmud of Ghazni; rather than back down, she issued a frontal challenge, throwing in his face that if she won she would have defeated the greatest commander of the era, but if he won he would only have defeated a woman.<sup>50</sup>

For much of its golden age, Central Asia was under the suzerainty of nomadic conquerors, whose women were fully accustomed to managing domestic affairs during their husbands' prolonged periods of absence. This resulted in a woman leading the powerful eleventh-century Karakhan dynasty for eight years, and in the mother, sister, and senior wife of the fearsome Tamerlane (Timur) completely dominating his life off the battlefield.<sup>51</sup> No one seemed surprised when the daughter of Central Asia's thirteenth-century Mongol ruler announced that she would refuse to marry any man she could defeat in arms.<sup>52</sup> Notwithstanding these clear marks of political might, in none of these nomadic societies did females emerge as visible intellectual figures.

Finally, it is necessary to speak of the countless scientific disciplines, philosophical concerns, and theological questions to which the actors in this story devoted themselves. Each of these should be, and in many cases has already been, the object of special research. To delve further into each of them would take us beyond the bounds of this inquiry, and certainly beyond the competence of this author. Those seeking a more detailed history of Central Asian science, philosophy, theology, architecture, or art, or further biographical details on the extraordinary people who made these subjects their life's work, should turn to the rich specialized literature in many languages that is discussed briefly in the preface and cited in the notes.

With this introduction and these caveats, let us now turn to the Age of Enlightenment in Greater Central Asia, which lasted to the twelfth century. Unlike the Greek goddess of wisdom, Athena (who, incidentally, found devotees in early Central Asia), this epoch of cultural flowering did not spring fully formed from the head of Zeus. Rather, it arose from an ancient but highly developed land that for centuries had maintained a booming economy and a rich intellectual life. Let us turn, then, to the lost world of pre-Muslim Central Asia.