**Another Voice Podcast with Eric Nelson**

**to accompany Strayer/Nelson, *Ways of the World*, Third Edition**

**Technology and Trade: Europe’s Oceangoing Ships (Chapter 14)**

**SLIDE 14.1**

During the early modern era, Europeans created empires in the Americas and numerous trading connections in Asia and Africa that set them on their journey to global dominance. However, to achieve this dominance they had to get there, crossing the world’s oceans to an extent never before achieved. How did they do it? What kind of ships and navigational aids facilitated this remarkable accomplishment? Were they the product of European technological invention or did the Europeans borrow innovations created elsewhere?

**SLIDE 14.2 [Image: Columbus Engraved]**

The relatively small wooden ships that carried settlers and slaves, silver, spices, and furs may seem simple, even crude, by today’s standards, but they were among the most complex machines in the world at the time. Innovations in ship design, navigational tools, and armaments came together in European ports and shipyards during the fifteenth century to create for the first time European ships capable of transoceanic voyages and projecting military power at a great distance from home.

**SLIDE 14.3 [Image: Dona Marina]**

In terms of ship design, from the fourteenth century western European shipwrights reversed long-standing ship construction techniques by building the ship’s skeleton first before attaching planks to it, creating stronger hulls that could both carry more cargo and better withstand the rough seas off the coast of northern Europe. The new hulls could also accommodate more masts and more sophisticated combinations of sails including both traditional square sails for sailing downwind and lateen or triangular sails—long used in the Mediterranean—that allowed a ship to make progress even against prevailing winds. Never before had Europeans produced ships with such sea worthiness and propulsion power. Europeans had caught up with the capabilities of Chinese ships which had long plied the trade routes of the China Sea and Indian Ocean.

**SLIDE 14.4 [Image: Chinese Astronomy]**

Long-distance voyages across the Atlantic, and later the Pacific Oceans, also required innovations in navigational techniques. These techniques allowed a ship’s captain to calculate his speed, course and location on a map without the help of landmarks. To sail beyond the sight of land, often for weeks at a time, Europeans drew heavily on technologies developed elsewhere in the world. Most important, Europeans borrowed from the Islamic World the astrolābe and quadrant, two instruments used to calculate longitude—that is ones location north or south of the equator. By the thirteenth century, European mariners had also adopted the Chinese magnetic compass used to establish a ship’s bearing. This invention arrived in Europe through Indian Ocean intermediaries and became a useful tool on transoceanic voyages. Europeans made these technologies more useful by creating extensive sea charts that included detailed information on landmarks, compass bearings, and prevailing winds and currents.

**SLIDE 14.5 [Image: Celebrating de Gama’s arrival in Calicut]**

Gunpowder weapons and especially cannons gave European ships significant advantages both in defending themselves from pirates and engaging in naval warfare. Again, Europeans relied on borrowed technologies and local innovations to produce these weapons. The Chinese had invented gunpowder sometime in the ninth century and Europeans learned of it probably through Mongol or Muslim intermediaries. By the fifteenth century, Europeans had developed the most advanced cannon in the world to take advantage of gun powder’s potential. The new, sturdier hulls of European ships proved stable enough for mounting and firing heavy guns, giving their crews a significant advantage in firepower over rivals.

**SLIDE 14.6 [Image: Japan’s Modernization]**

Still, while advanced machines for their times, sailing the trade routes of the early modern period was a dangerous proposition. The small wooden ships and their crews had to negotiate great distances with only crude navigational tools and little likelihood of help if they ran into trouble. Technology had its limits.

Over the next several centuries, European mariners developed further innovations that increased the size, speed, payload, firepower and maneuverability of their vessels. But their propulsion systems and designs remained basically the same until the emergence of steam engines and iron ship construction in the nineteenth century, when the new technologies of the Industrial Revolution transformed ships once again.