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Unit-IV

Science and Scientists

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- The Scientific Revolution was nothing less than a revolution in the way the individual perceives the world.
- It wasa epistemological revolution -- it changed man's thought process
- intellectual revolution -- a revolution in human knowledge
- attempted to understand and explain man and the natural world.
- Polish astronomer Nicholas Copernicus (1473-1543), the French philosopher René Descartes (1596-1650) and the British mathematician Isaac Newton (1642-1727) overturned the authority of the Middle Ages and the classical world.

- intellectual in nature and consisted of the triad of Aristotle(384-322), Ptolemy (c.90-168) and Galen (c.130-201)
- The revolutionaries of the new science had to escape

their intellectual heritage.

- the revolution in science which emerged in the 16th and 17th centuries has appeared as a watershed in world history
- British historian Herbert Butterfield (1900-1979), *The Origins of Modern Science:The Revolution in science overturned the authority in not only of the middle ages but of the ancient world -- it ended not only in the eclipse of scholastic philosophy but in the destruction of Aristotelian physics.*

- *'The Scientific Revolution outshines everything since the rise of Christianity and reduces the Renaissance and Reformation to the rank of mere episodes, mere internal displacements within the system of medieval Christianity.'*
- Copernicus, Galileo, Newton, Darwin, Einstein and others were the reasons for sceintific revolution
- science has a language all its own, a language which uses expressions like: rational, method, methodological, systematic, rules, laws, behavior, experts, technology and so on.

- In the 16th and 17th centuries, scientists, theologians, philosophers and mathematicians were engaged in a vigorous debate over the natural world.
- **The medieval world view** -- the linchpin of the Christian matrix -- was fashioned from the ideas of four men. Two of them were from the ancient world -- Aristotle and Ptolemy. And the other two were of the medieval world -- St. Thomas Aquinas (c.1225-1274) and Dante Alighieri, (1265-1321).
- Nature was conceived to be kept going from moment to moment by a miracle which was always new and forever renewed.
- It was God who ordered the universe through these miracles. This entire scheme depended not only upon God, but upon the individual's absolute and unwavering faith in God. If God pronounced it to be so, then it must be so.

- 1350, let's say, by the time of Petrarch (1304-1374), many were intersted in understading the miracles
- According to the intellectual tradition stretching from Aristotle to Dante, all things in nature -- all phenomena -- are composed of four fundamental elements. These elements were air, fire, earth and water.
- These elements were believed to follow certain laws -- they were to follow their ideal nature.
- So, since they are heavy and coarse, water and earth move downward. Likewise, since they are light and airy, air and fire move upward.
- Each of the four elements is constantly striving to reach its natural center. The striving of all these elements is what kept the cosmos going.

- the elements of air and fire predominated and together they composed a fifth element, more pure than the rest, which the ancients called "the aether.“
- And since the heavenly bodies are "up there," they must be composed of "the aether.“
- Newton was struck by an idea -- the idea that the force which held the planets in their orbit was the same force which caused an apple to strike him in the head.
- First, medieval man did not see the movement of the heavenly bodies from the standpoint of the mechanics of motion.

- At the center was an object about which nine concentric sphere were situated. This object was the earth. Beyond the earth, its position fixed, were the Moon, Sun, Mercury, Venus, Mars, Jupiter, Saturn and then the stars, and finally, the Prime Mover, the First Cause, God
- the Scientific Revolution could almost have been called the Copernican Revolution
- Nicholas Copernicus (1473-1543), Copernicus who determined that the sun was at the center of the cosmos and that the earth moved. Such an opinion alarmed his contemporaries who could not explain that if the earth were spinning then why was it that an arrow shot into the air didn't fly off the face of the earth -

- his findings in 1543, the year of his death. It was in that year that Copernicus published his magnum opus, *De revolutionibus orbium coelestium* (*On the Revolutions of the Heavenly Bodies*) at Nuremberg.
- Danish astronomer, Tycho Brahe (1546-1601). The star was brighter than any other star for more than two years -- contemporary accounts tell us that the star was so bright that it could be seen in daylight. And in 1600, another star appeared.
- This star was observed by Johannes Kepler (1571-1630). The heavens seemed to be in flux. Such occurrences made lasting impressions on all men, whether scientist or not. After all, this was an age in which men believed their fate to be written in the stars and now those stars were changing.
- What Brahe and Kepler had seen were super-novas, the explosions of old stars.

- Copernicus: in his books *The Mysterious Universe*, 1596, *The Harmonious World*, 1619, explains that Nature loves simplicity.“
- From his friend Brahe, Kepler learned that it was necessary to take more accurate measurements while observing the movement of the heavenly bodies.
- In the end, Kepler determined the three laws of planetary motion, which he published between 1609 and 1619. (1) planets move in elliptical orbits. (2) explained the varying speed of the planets and so, retrograde motion, (3) relates the movement of one planet to all the others.