

LECTURE FOR HISTORY 2: November 6th, 1952: 3.30 PM
October 25 1954: 2.30 PM

Father Mc Carthy } has asked me to ~~lecture on this~~ address you
for Kennedy
this afternoon. He has lent me a copy of the text book which
you are using
~~to lecture on your textbook in history~~ this term is: the first
volume of A Political and Cultural History of Modern Europe
by Carlton Hayes.

The edition which you are using is the revised edition of 1932. *(24th printing 1953)*
It is the latest edition, which has often been reprinted, but
has not been revised in the past twenty years.

The First Part of ~~the~~ the First Volume of Hayes deals with
"The Forming of Modern Europe"

The Third Chapter of this First Part is entitled "The Intellectual
Quickening".

The fifth article of this third chapter is on "Scientific
Development"

Mr Kennedy }
Father Mc Carthy } has asked me to ~~take as my topic~~ give a lecture
on the ^{3 1/2} first four pages of this article, that is on pages 122 to
¹²⁵ 126 of Hayes, vol. I., *starting in the middle of page 122*

In these ^{3 1/2} four pages there are mentioned ~~five~~ ^{four} astronomers:
~~five principle persons:~~

Nicholas Copernicus (1473-1543) *Pole: Catholic*

~~Pope Gregory XIII (1502-1585) (Pope: 1572-1585)~~

Tycho Brahe (1546-1601) *Dane: Protestant*

John Kepler (1571-1630) *German: Protestant*

Galileo Galilei (1564-1642) *Italian: Catholic*

These four men influenced not only the history of astronomy, but the
cultural history of Europe.

First of all I would wish to say a word on the ~~personal~~ background
and personal character of each of these men.

Copernicus, Brahe, Kepler and Galileo had this in common, that they were all university graduates. Their university training had a tremendous influence on their later careers.

On the other hand: The up-bringing ~~The upbringing~~ and character of each of the four was very different. The influence they had was greatly coloured, not only by their university training, but also by their character.

It is worth while to stop and think on that fact.

There is a very old saying that as the twig is bent, so the tree is inclined. ~~The~~ aphorism, seems to me, to be too static.

History suggests that the influence of a man's character has a more dynamic effect than merely inclining the tree.

If any of you effect the future history of Canada or of the Church or of any particular science, the effect will be a reflection of ~~your~~ the character which you show in college.

Her Holiness
Galileo, ~~xxxxxxx~~ ^{gentle} was always vain and impetuous. ^{or He came from middle class stock} When he ~~became~~ became to be an eminent professor of physics, his vanity and impetuosity got him into trouble. His vanity also engendered a not too healthy ambition. ~~He was born of middle class parents, and he~~ ~~ambitioned~~ ~~to raise himself by the~~ ~~shoe straps to a higher level.~~

Kepler was ~~born~~ of a poor family. He went to university on a scholarship. He had to work hard. When he ~~was~~ graduated he had to take a job as an astronomer and mathematician. ~~Being~~ ~~mathematic~~ Teaching mathematics and doing research in astronomy for his patrons was his bread and butter. He was a German, and he worked hard, and met success.

Tych Brahe, a Dane, was born of a well-to-do family. He went to university, because young men of his social standing were supposed to go to university. He studied medicine, as many then did to get a good all round education, - not because he particularly wanted to be a doctor or was looking for a lucrative practice.

By accident, as I shall tell later, he became interested in astronomy. He worked hard at it. Like Galileo, he was ^{not} vain. *Like Galileo, he was proud.* His social standing made a difference. His ^{pride} vanity manifested itself in an ~~extreme~~ intolerance, and pig-headedness, *which fastened him the favour of his King*

Copernicus was the most likeable character. He was born of a very aristocratic and wealthy family. No worries of the future ever crossed his mind. He was gentleman and a scholar ~~text~~ and an aristocrat to the finger tips.

Copernicus was born in Poland (at Torun ~~1473~~ in 1473) (Torun on the River Vistula 92 miles south of Danzig)

(1491-95)

Before he was old enough to go to College, both his father and his mother were dead. It was his uncle, a Bishop (Luca Watzelrod) who ~~decided~~ guided ~~his~~ the early days of his academic career. Almost automatically he went to the University of Krakow and took a masters degree in Arts. ² While there he studied astronomy as every good artsman of those days did.

When he was finished, his uncle suggested that he proceed to the university of Bologna to take a degree in Canon ^{& Civil} Law.

His uncle conferred upon him minor orders (the same as modern seminarians get at the end of their first year of theology), and he proceeded to Bologna in Italy, registered as a cleric and started his course in Canon Law. (*Registered at Bologna Oct 20, 1597*)

1. Torun 125 m. NW of Warsaw
2. Krakow 200 m S. of Torun and 180 m. S.W. of Warsaw.

(1497-1500).

At Bologna university, Copernicus followed not only the lectures ~~We have not any details of his life at Bologna, but reading~~ in canon law, but also the lectures ~~in civil law, and many of~~ between the ~~lines, I suspect that Copernicus played hockey~~ from the lectures in science given for medical students., which included several of his lectures in Canon Law, and that he did so in order to go to lectures on astronomy and mathematics.

~~In~~ The year 1500 was Jubilee Year, so Copernicus went to Rome for the Jubilee. He had been ~~five~~³ years at Bologna, and it would seem that he left without a degree. ~~Now, in Bologna, in those~~ taking In England and Europe one still talks of 'taking a degree'. In the early days of the universities ~~days they had the out system. They had no examinations, just~~ (and in the time of Copernicus) many went to ~~the univers~~ a university ~~outs. Any man who took an oath that he had attended 90% of~~, satisfied the requirements for a degree, but did not take one. ~~the prescribed lectures got his degree. I suspect that Copernicus~~ ~~couldnt take that oath.~~

When in Rome, he lectured on astronomy and mathematics. There is a famous painting by Gerson (1831 ~~to~~ 1901) which shows Copernicus lecturing in Rome, and among ~~his listeners~~ his audience are Leonardi da Vinci, Pope Alexander VI and a famous ~~astronomer~~ Bolognese astronomer, Novara (1454-1504)¹. Whether this is a flight of the painters imagination or represents fact we are not sure.

When the Jubilee was over, Copernicus went to Padua and enrolled at the university there as a student in medicine. ~~He was~~ Three years later ~~just getting his degree in medicine (1503) when~~ his uncle wrote asking him to come home to be his secretary. Before going home, he went to Ferrara (40 m.S.W of Padua. 30 m. NE of Bologna) for a year and took a doctorate ~~picked up a degree~~ in Canon Law. ~~(which is what he came to Italy for,~~ ~~nine years before)~~ He did not take a degree in medicine because ~~he~~ ^{wish} did not ~~intend~~ to be a doctor of medicine. He did not take a degree in canon law from Bologna, because Ferrara was, at this time, deemed to be superior to Bolgna for canon law.

Padua (1501-1503)

1503 May 31.

¹ Michel Angelo also supposed to have listened to his lectures (Pastor))
Novara taught Copernicus at Bologna.
In Wojciech Gerson's print there are 20 persons listening to Copernicus
(The painting in ^{Nic. Cop.} by S.P. Novara, N.Y., 1943 p.44)

Copernicus had spent 12 years ~~in~~ as a university student, when he returned home to become secretary to his uncle the bishop. ~~His~~ The bishop had already made him a canon of the cathedral. Nowadays one cannot be named a canon unless already a priest. In Copernicus' day it was not so. It was sufficient to be a cleric. It would seem that Copernicus was never ordained. He was a cleric, and dressed like a cleric, but was not a priest. He was a good holy and charitable man. He acted as physician to the bishop and to the poor of the neighbourhood. And, in his spare time he worked at his astronomy.

Now, until the time of Copernicus, it was generally accepted that the sun rose in the east and set in the west; that it went round the earth every day.

~~In the~~ In the universities which Copernicus attended, the theory on the motion of the sun, moon and stars which was taught was ~~that~~ known as the Ptolemaic System

The Ptolemaic System was called after Claudius Ptolemy, who worked out his system about 150 AD.

Ptolemy was a native of Egypt. He lived in Alexandria (and was possibly born there). ~~Alaxa~~ His language was Greek.

He wrote a book called Syntaxis by him, and The Almagest by later Arabs. It was a summary of astronomy. It supposed the earth to be in the centre of the universe, and the sun to circle round the sun once a day. He showed how to calculate the positions of the sun, moon, or planets for any given time. ~~It was used~~ His explanations were used to predict the ~~positions of the~~ positions of the planets for ~~five~~ years ahead. The planets seemed to follow the time table drawn up. But after a while they started to run off schedule. So Ptolemy's system had to be revised. In the course of centuries it had to be revised again. By Copernicus time, there were so many exceptions and corrections and emendations to Ptolemy's system that it was a mess, and the calculation of the positions of the planets a complicated affair.

During Copernicus' 12 years as a university student he had plenty of time to think about the matter quietly. He read of how an ancient ~~Greek~~ Ionian Greek, Aristarchus of Samos (c.280 BC) (Sarton, I, 156) had suggested that the sun did not go round the earth, but the earth turned on its axis.

Aristarchus' suggestion was never seriously considered. He had ~~not~~ not worked out details, of the consequences of his suggestion. His suggestion was dropped in the ash can.

Copernicus decided to investigate it. He worked out details.

He made observations on the sun to correct his theory.

~~At~~ By 1507 he had worked out his new theory. He used it himself for his calculations, ~~for~~ and found it much simpler than the Ptolemaic system.

In 1517: Luther nailed his 95 "theses" to the church door at Wittenberg

In 1520 Luther was excommunicated.

1529 Mar 12 is date of last observation recorded in Copernicus De Rev (1543)

In Poland, people were asking Copernicus to publish an account of his theory.

or 1530
~~In 15~~ About 1529 "wrote a brief sketch (Commentariolus) of his astronomical system. The Commentariolus was not printed; a number of handwritten copies circulated among students of science."

(Edward Rosen, "The Commentariolus of Copernicus" Osiris, vol III, 123-141, (1937), 123)

There are three copies of this mss. existing to-day. One in Vienna, one in Stockholm and one in Leniggrad. (Rosen, 123)

I have seen a translation based on the Vienna and Stocholm mss.

As regards the ~~sun, Copernicus~~ Earth, Copernicus theory was this:

- (1) The earth rotates on its axis evry 24 hours;
- (2) The earth revolves around the sun every year:
- (3) The axis of the earth has a conical motion. The axis of the earth traces the outline of two cones. The apex of each is at the centre of the earth. The base of one is a circle described by the north pole; the base of the other a circle ~~xxx~~ described by the south pole.

The motion of the axis of the earth is similar to the motion of the axis of a spinning top. One can notice how the pole of a spinning top describes a circle as the top starts to spinning slowly before falling.

The conical motion of the axis of the earth is very slow.

The north pole describes a circle every 25, 800 years.

At present the axis of the earth points up to what we call the North Star (which is Alpha Ursae Minoris to Astronomers); in about 12,000 years, Vega (Alpha Lyrae will be the North Star).

North Star (1970) $02^h 02^m : +89^{\circ} 08'$
Vega $18^h 36^m +38^{\circ} 25'$

The Celestial pole describes a circle of radius $23\frac{1}{2}^{\circ}$ around the ecliptic pole. (It takes 26,000 years to describe the circle).

Copernicus' theory that the sun did not move was revolutionary. He had a great deal of mathematics to prove his theory. Learned professors were greatly interested. Copies of his Commentariolus were made. Professors talked about it. Students thought it was a great joke: The sun doesn't move; we only imagine that it does. As early as 1531, it was joked about in a play in a theatre in Elbing (33 miles ESES of Danzig).

In 1533 a ~~scholar~~ scholar in Rome (Johann A. Widmanstter) ~~expressed~~ enthusiastically expounded the theory to Clement VI (Julius de Medici, 1478-1534), Pope (1523-1534)

In 1536 a Cardinal (Schoenberg) pleade with Copernicus to publi~~sh~~h his theory.

On June 4, 1539, Luther came out: "The idiot is bent on upsetting the whole science of astronomy" (Hartmann Grisar, Luther, 6 vols, (St Louis, 1915-1917) vol.VI, 25)

In July 1539, a protestant ~~scholar~~ professor from Wittenberg came to Frauenberg for first hand information. Copernicus let Joachim Rheticus publish a description of his system. It appeared in Danzig under the title Narratio Prima.

On Oct 16 1541, Philipp Melanchthon (Luther's fellow labourer) writing ~~wrote~~ to a friend referred to "the absurd notion" of "the Sarmatian Astronomer, who is trying to stop the sun and move the earth." And he added that the authorities should restrain such lincence of mind. (Corpus Reformatorum, Vol.4, p.679 (edited by K.G. Bretschneider, 1776-1848), reproduced by Mizwa, p.32)

But there was no public outcry against the Narratio.

1 Joachim Rheticus (1504-1576). Died 1576 (Zhoude, V, 417)

Copernicus turned over his complete treatise to ^a publisher~~s~~ (Joh. Petreius) at Nurnberg . On the very day that Copernicus died, may 24, 1543, there came off the press his great work Concerning the Revolutions of the Heavenly Spheres.

After the appearance of Copernicus' book Melanchton came into the open and said that it was a sin and a scandal to publish such nonsense. (J.L.E.Dreyer, Planetary Systems, (Cambridge, 1906), 353.