Lecture 14

Weds: HW by 5pm

Fri: Read. Mondsch pg 64-65, 68-74
Barnett Ch 8

Development and History of Early Mechanical Clocks

When did the first verge and foliot clocks appear?
Who designed + produced the first verge and foliot clock?
Was the verge and foliot clock developed from pre-existing clocks?

We would expect that the answers to these questions would be known but the answers are not conclusive and very vague.

What we know for sure are:

1) the oldest existing verge-and-foliot clock, that in the Salisbury Cathedral, dates to 1386.

2) the verge-and-foliot escapement is described in detail by Giovanni Dondi in his description of a planetary clock (1365)

Demo: Dondi Planetary clock
- show pages

3) Richard of Wallingford, the abbot of Benedictine monastery at St. Albans described aspects of a clock that relied on mechanical means (1320) although the precise details are unclear.

Demo Videos of Wallingford Clock.

1 Development of the mechanical clock

This exercise and discussion will consider evidence for the historical development of the mechanical clock. We will consider two sources of information:

- Mondschein K., *On Time: A History of Western Timekeeping,* Johns Hopkins University Press (2020) (pages 52 – 64).
- North J. D., *Monasticism and the First Mechanical Clocks,* In: Fraser J.T., Lawrence N. (eds) The Study of Time II. Springer, Berlin, Heidelberg (1975).

The machinery of mechanical clocks can be classified as: the verge and foliot regulating mechanism and everything else (gear trains, axles, ropes, ... that drive the dial, bells striking mechanism, etc.). The crucial feature of a true mechanical clock is that it uses a verge and foliot and what we would really like to establish is when and where that first appeared.

The purpose of this exercise is to assemble some evidence to decide when the verge and foliot first appeared, to describe the nature of this evidence, where it can be found and assess its reliability. You should include this in the answers to all of your questions.

a) It appears that clocks that used machinery had appeared during the 10^{th} and 11^{th} century in Europe. Did these clocks appear to use water or machinery (such as a verge and foliot) to regulate timekeeping ?

Mondschein pg 53 - writings indicate early clocks used water.
- contemporary discussion of repair of water clocks

North pg 382-383 - incomplete account of clock in Ripoll → show article
- refers to article by Drover
- Bury St Edmunds abbey fire.
- Villers Abbey late 1200s.
- Bible moralisée illustration - illustration

Ferré-Olive AH Vol 18 No 4 1989
Drawing 12.76
Text earlier

b) A possibly crucial piece of evidence about the existence or non-existence of a purely mechanical clock appeared in a 13^{th} century text. Describe this and what can be inferred from it about the existence of a purely mechanical clock.

Text of Robertus Anglicus 1271 → North pg 384 → Mondschein pg 54

- discusses the need for a mechanical clock that has not yet been constructed
- does not indicate V+F escapement.
- could be infered that no V+F escapement existed at this time
  - maybe author unaware of other developments outside England??

c) What evidence points to the existence of purely mechanical clocks from the late 13th and the early 14th centuries?

North: - increasing references to horologia in late 1200s.
Pg 384 - suggestion that first recorded clock in Bedfordshire
-385 - records from various English cathedrals late 1200s
(not necessarily each conclusive but volume suggests something)
- Italian clock in Milan 1309 - mentioned in Fiamma's chronicle.
- Financial records construction of Norwich clock and difficulties in construction 1321-1325 - could it be a water clock?

Mondschein - Dantes writings.
pg 57 - apparent all mechanical clock belonging to Philip of France, pre 1314.
- monastic references (vague).

d) Generally, what is the form of this evidence (actual objects or writings)? How reliable do you find this evidence? How could you begin to strengthen the evidence, using reasonable resources, that you have seen so far?

- these do not appear to be remnants of actual objects until the late 1300s
- we have to rely on writings that include:
  * literature (plays, etc, ...)
  * monastic + church records
  * other contemporary accounts of life
- the contents of these writings are often vague and imprecise.
- could strengthen the evidence by reading other sources that these articles describe

List of clocks pg 61-
in the records
1320 - 1340
eventually Dondi manuscript.

to show image of manuscript.

- suggest refering to Rossum.

→ Show KBR medieval clock.

Various possible pieces of evidence for early water clocks with machinery are:

1) clepsydra in monastery in Ripoll, now Spain. ↓ Rossum pgs 64
2) monastery of Bury St. Edmunds, fire 1198
3) instructions for maintaining clocks in monastery of St. Victor in Paris (1140 on), Abbey of Villers-la-Ville in Brabant (1267-1268) (last recorded evidence for a water clock in Europe)

Records regarding (possible) mechanical clocks aside from those mentioned previously are:

1) Dominican monastery of St. Eustorgio, Milan (1306)
2) Refeorces in literature - Roman de la Rose (1275-1280)
   - Dante's Divine Comedy (1315-1321)
3) Expenditures for clocks described in monastic records (1280 onwards)
4) Profession of clockmaker appears in 1270

Known early clocks include (Barnett)

1) Cathedral at Beauvais 1324
2) St. Gothard, Milan 1335
3) Monastery at Cluny, 1340
4) Cathedral of Chartres, 1359
5) Public clock at Padua, 1344