

Lecture 31

Fri's Bennett. 118 - 127
 Monds 137-142

Mon:

Early 19th century timekeeping

In the early 19th century, at least in England, there had been changes in factory workplaces which resulted in an increasing demand for clocks + watches amongst the ordinary populace.

Nevertheless timekeeping was still generally local and the state of transportation and other communications meant that there were limited situations where ordinary citizens would need to interact with others outside their own localities.

1 Reference clocks and local time

Consider timekeeping in one town or city during the 18th or 19th centuries. The city might have had a "master" clock which the local citizens used to check and set their watches. This would have been on a prominent public building.

- a) In your particular town or city, what could serve as a "reference" against which any such "master" clock might be checked? What difficulties might arise with using this "reference" clock?
- * It would have to be checked against the Sun - the moment at which local noon occurred.
Alternatively it could be checked against the motion of stars
 - * These would require observatories and observational skills (specialized)
- b) Would your master clock keep the same time as another in a different city, assuming that they were both working correctly?
- No, if the cities were at different longitudes then local noon would occur at different moments.
The clocks would be offset.
- c) These master clocks would keep local time, based on local noon or a comparable phenomena associated with the stars. By how much would local time in Grand Junction differ from local time in Denver?

Denver	104.99° W	⇒ difference = 3.56° longitude
Grand Junction	108.55° W	

Then $1^\circ \rightsquigarrow 4 \text{ min} \Rightarrow 3.56^\circ \rightsquigarrow 3.56 \times 4 \text{ min}$
 $= 14.24 \text{ min}$

If we use the motion of Sun or stars as a reference or authority for timekeeping then times will necessarily be local

⇒ Each location would have its own time. Locations at different longitudes would have clocks which run at the same rate but are offset.

This situation prevailed in England and the United States in the early 1800s. Even in England times could differ from E→W by about 30 min.

So at one moment it may be
3:00pm in Plymouth
3:05pm in Liverpool
3:17pm in London
etc,...

Location	Long.	Time diff from Greenwich
Lowestoft	1.75° E	+7 min
Greenwich	0°	—
Birmingham	1.89° W	-7.6 min
Liverpool	2.99° W	-12 min
Plymouth	4.14° W	-17 min
Semen Cove	5.70° W	-23 min

This began to create issues and problems particularly with two types of transportation:

- 1) mailcoaches, introduced in the 1780s
- 2) trains, developed in 1830s and 1840s

Demo: Postal Museum — mailcoach

Mailcoaches

Mailcoaches were introduced in 1784 in England by the Royal Mail and transported both mail and passengers along a large network of roads throughout England.

Demo: Postal Museum Map

In order to provide efficient service the Royal Mail required their coaches to adhere to strict timetables. This would facilitate quick pick up and drop off of mail and passengers along the route.

Q: What issues would this pose? How might they be resolved?

The scheme was:

- 1) a timetable was set for the route based on time in London.
- 2) a guard on the coach carried a clock that was set to London time - this helped the coach adhere to the schedule Demo: Postal Museum Clock
- 3) London time had to be converted into local time at various locations along the route, so that people in these locations could co-ordinate with the coach.

This would clearly pose some logistical issues although they do not appear to be so severe as to modify timekeeping.

Railroads

Issues of co-ordination and timekeeping were far more pronounced as railroads proliferated. England led the way in this development. A brief timeline is:

Before 1800 - horse drawn wagons on wheels

1802 - first full scale railway steam locomotive Coalbrookdale locomotive.

- 1812 - first successful rack locomotive (Salamanca, Middleton Railway)
- 1813 - Puffing Billy, oldest surviving locomotive (Wylam coal mine
→ Lemington-on-Tyne docks)
- 1825 - Locomotion No. 1 - first public steam railway
- Stockton + Darlington railway
- 1829 - Stephenson Rocket - basic template for later engines
- increased speed + efficiency

Demo: Natl Railway Museum

- 1830 - Liverpool + Manchester Railway
 - first public railway using steam locomotives only
 - shipping supplies + products between ports, factories and mines.
 - first regular rail passenger service.
- 1840s - large scale expansion of railways in England
- 1850s - steam powered locomotives reach London

Demo: Bodleian library map of English railways

The railroad system in England was initially privately owned by various companies, usually serving particular regions

- 1) Manchester, Sheffield + Lincolnshire (later Great Central Railway) - EW from Manchester to east coast
- 2) Great Eastern Railway - London to east coast
- 3) Great Northern Railway - London to Yorkshire
- 4) Great Western Railway - London to Bristol
- 5) London + NW Railway - London to Birmingham to Liverpool.

Demo: Science Museum Group Railway Maps + Plans
Smith's Railway Map 1836

The railroads also maintained strict timetables. To do this effectively,

- 1) each railroad had to use one time
- 2) the railroad would use the time of the city of origin.

Difficulties were:

- 1) even in one rail network, there were many origins of trains and thus many times
- 2) there would be conflicting time systems between networks. with less incentive for co-ordination.
- 3) passengers would have difficulty co-ordinating transfers between lines.
- 4) serious safety issues arose as volumes of traffic increased.

Time tables required conversions, e.g. from London time to various local times

Demo: Science + Society Picture Library - railway timetable

Railway Time

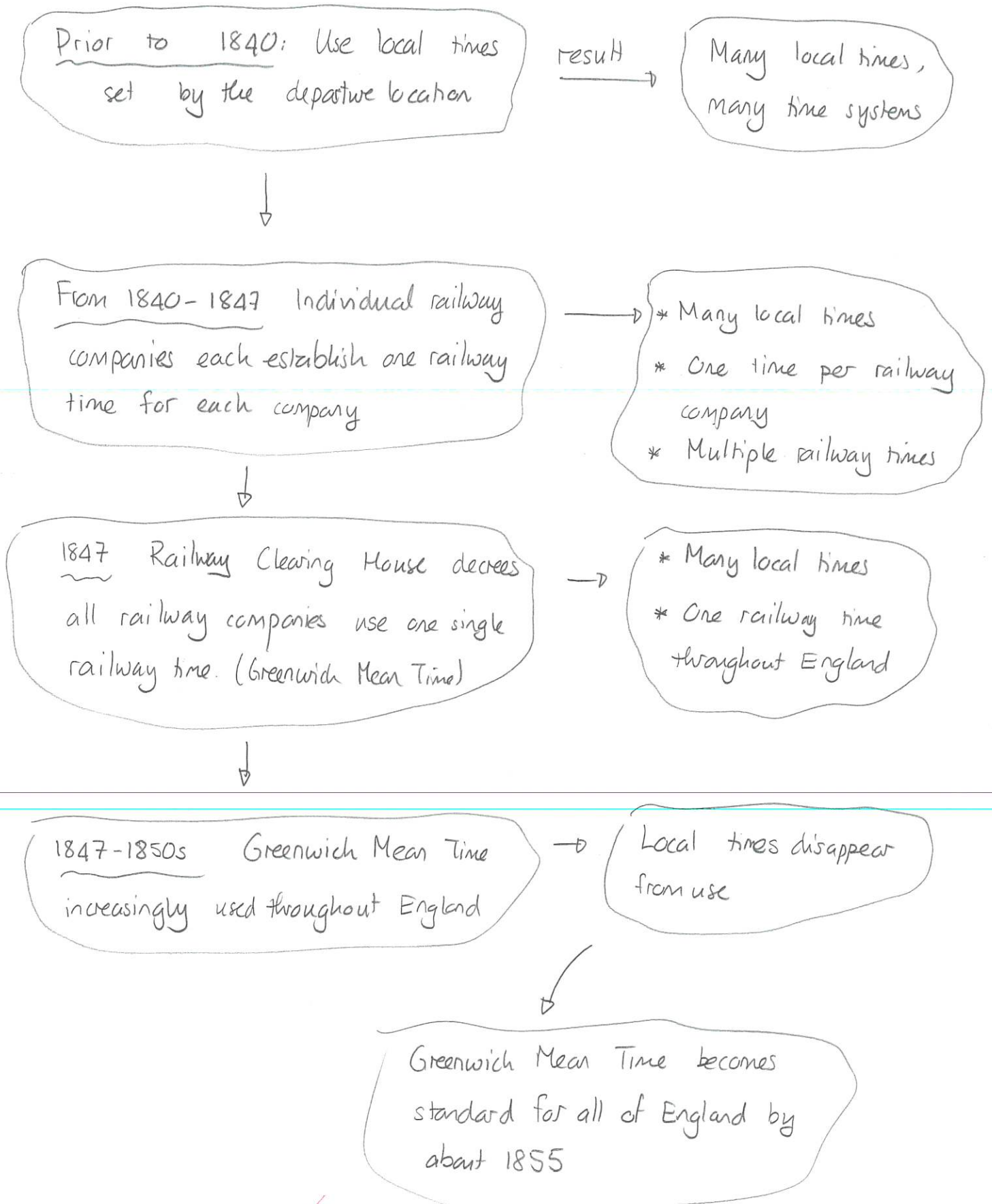
Railway companies in England eventually began to operate according to a single time. The Great Western Railway adopted London time for all points of departure on its network, in 1840. They decide to use Greenwich Mean Time and this came to be called "Railway Time":

Locations would then use:

- 1) railway time for all railway operations
- 2) local time for all else.

Demo: Corn Exchange Bristol image.

The process by which overall standardization occurred was:



↳ Greenwich Mean Time legally adopted 1880.