THE AUXILIARY SCIENCE OF HISTORICAL CHRONOLOGY AND ITS ROLE FOR CLIMATOLOGISTS

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State of the Art of Historical Climatology in International Perspective
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Outline

- What is historical chronology?
- The solar calendar in the Roman and Christian tradition
  - Different beginning of the new year
  - Different styles to express the exact day
- The Gregorian calendar reform of 1582 and its relevance for historical climatology
  - Avoidance of “fake dates”
  - Exact dating of single events (e.g. floods, harvest time) according to the actual solar year
  - Harmonization of long series
- Outlook: Challenges of historical chronology in other areas
Historical chronology

- Auxiliary science of history dealing with the different systems to measure time
- Main task: search for the correct dating (year, date)
- Advanced knowledge in historical chronology is extremely important for historical climatology
  - Avoid doubled events
  - Harmonize between different systems of dating
- Basic tool by German historian Hermann Grot efend (1845-1931)
  - Handbuch der historischen Chronologie des deutschen Mittelalters und der Neuzeit (1872)
  - Zeitrechnung des deutschen Mittelalters und der Neuzeit, 2 vols. (1891-1898)
  - Taschenbuch der Zeitrechnung (17 editions since 1898)
  - Online: http://www.manuscripta-mediaevalia.de/gaeste/grotefend/grotefend.htm
Counting the years

- Olympiads (Greece)
- Roman Empire
  - From the foundation of Rome (Roman Empire)
  - In the year of the consuls X/Y (Roman Empire)
- From the creation of the world = 5507/5508 BC (Byzantine Empire)
- BC / AD (CE)
  - Introduced in 525 AD by Dionysius Exiguus
  - Propagated by Bede the Venerable, 8th c. AD
- From Mohammed’s Hedschra = 622 AD (Islamic countries)
- From the beginning of the French Revolution = 1792 (French revolutionary period)
- From the beginning of the Fascist rule in Italy = 1922
Counting the years, months and days
The French revolutionary/republican calendar (1793-1806)

5 additional days in September

12 new months of 30 days each

Year 9 = 1801

Three decades instead of weeks

months with “pheno-locical” names
Counting the years
Inscription on a living house in Rome erected by the Fascists in 1940 (18th year from the Fascist revolution)
Starting date of the year

- Circumcision style (1 January)
  - Germany (since 16th c.), France (since 16th c.), Russia (since 1701)
- Old pre-Caesarian Roman calendar (1 March, cf. September etc.)
  - Venice (until 1797), Russia (until 13th c.)
- Annunciation style (25 March)
  - Florence, Siena (later start), Pisa and others (earlier start)
  - Spain, Portugal (until 14th c.)
  - England (11th c. until 1752)
- Easter style (changing dates in March/April)
- Byzantine style (1 September)
  - Russia (13th c. until 1701)
- Christmas style (25 December)
  - Dominating in many European regions until the 16th c.
Systems to express the exact day

- **Roman calendar system (valid also through the Middle Ages)**
  - 12 months (starting with March)
  - Kalendae = 1st
  - Idus = 13th / 15th (March, May, July, October)
  - Nonae = 5th / 7th (March, May, July, October)
  - III [before] Id. Mart. = March 13th

- **Dating according to Christian feasts**
  - On Monday after St Laurence 1349
  - On Pfincztag (Thursday) before Pentecostë 1472
  - 35 different Easter constellations (see Grotefend)

- **Modern system counting the days of a month**
  - Widely spread since the Renaissance
  - Propagated by the early almanacs (printed calendars)
The Gregorian calendar reform

- Solar calendar introduced by Julius Caesar in 46 BC
  - Year: 365 days, 6 hours
  - One additional leap day every fourth year
- Solar Year is in fact 365 days, 5 hours, 48 minutes, 46 seconds
- 1582: 10 days difference between calendar and actual solar position
- Pope Gregory XIII – reform of the calendar system
  - Oct 4th 1582 = Oct. 14th 1582
  - No leap day in future in the years 1700, 1800, 1900, 2100 etc.
- Reform only accepted in the catholic countries
  - Protestant countries mostly followed this reform only from around 1700
The Gregorian calendar reform
Europe during the Reformation period

- Unity of the Christian church ends in the early 16th c.
- Struggle of confessions
  - Areas remaining catholic (Italy, Spain, Portugal, France, parts of the Hapsburg territories)
  - Lutheran church (northern Germany, Nordic countries, parts of the Hapsburg territories)
  - Zwingli and Calvin (parts of Switzerland, France, Great Britain, Hungary, Netherlands)
  - Anglican church of England
- Peace of Augsburg (1555)
The Gregorian calendar reform
Introduction of the new calendar system

<table>
<thead>
<tr>
<th>Year</th>
<th>Regions</th>
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<tbody>
<tr>
<td>1582</td>
<td>Italy (most territories), Spain (including Spanish Netherlands), Portugal, France, Poland-Lithuania</td>
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<tr>
<td>1583</td>
<td>Most of the catholic territories in Germany, Hapsburg territories in Austria, Holland, Zealand</td>
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<td>1584</td>
<td>Bohemia, Moravia, Silesia</td>
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<td>1587</td>
<td>Hungary</td>
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<td>1612</td>
<td>Prussia</td>
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<td>1700</td>
<td>Protestant territories of the Holy Roman Empire, Denmark, Norway, Northeastern parts of the Netherlands</td>
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<tr>
<td>1752</td>
<td>Great Britain (including the British colonies in North America)</td>
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<td>1753</td>
<td>Sweden</td>
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<td>1873</td>
<td>Japan</td>
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<td>1912</td>
<td>China</td>
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<td>1917/18</td>
<td>Ottoman Empire, Russia</td>
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<td>1923</td>
<td>Greece</td>
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The Gregorian calendar reform
The situation in Switzerland (confessions around 1700)
The Gregorian calendar reform
Almanacs covering the old and new calendar system

Almanac from the 1620s.
Source: Historisches Archiv der Stadt Köln, Bestand Best. 150 (Universität), A 1092
Consequences for historical climatology

- Exact dating needs specific knowledge in auxiliary science of history and interdisciplinary cooperation
  - Use of the Grotefend handbook essential
  - Micro-spatial resolution necessary
- Specific dates (e.g. extreme events such as floods, avalanches)
  - Avoidance of “fake dates”, in particular for 25 December to 25 March
  - Harmonization of sources from regions with parallel systems
- Phenological data for climate reconstruction
  - Any data for plant phenology (bloom, harvest) and snow/ice phenology to be transferred into Gregorian style
  - Long-time series for pre- and post-1582 periods possible
  - Harvest data from regions with parallel systems can be combined with caution
Floods and ice-breakups of the Traun River
Beginning of bridge repairs in spring (1521-1599)

Figure based on: Wels, Municipal Archives, BAR 1521-1599; Rohr 2007: 210.
Outlook

- Enlarged cooperation of interdisciplinary teams for pre-modern European history of climate necessary
  - Cf. historical seismology: old earthquake catalogues “purified” from “fake quakes”, e.g. 25 January 1347 (instead of 1348)
  - Exact and harmonized dating as important task for Europe-wide databases such as Euro-Climhist (www.euroclimhist.unibe.ch)

- Situation in other regions of the world
  - Comparative studies about methodological problems in historical climatology
  - Islamic areas: problems arising with the lunar calendar?
  - Eastern Asia: problems with the parallel use of solar and lunar systems?

- Last minute call for cooperation or additional papers
  - Contribution to the special issue of Climate of the Past
Thank you for your attention!

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