The reality of precision in the 19th century: re-evaluating the role of geodesy

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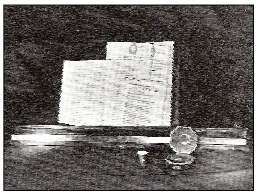
Stockholm, June 2008

Introduction

- The archive meter
- The International Meter



Historiography of the metric system: its creation and initial failure

- Practice
- Science
- Culture

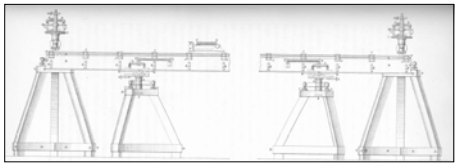
Historiography of the metric system: its international success

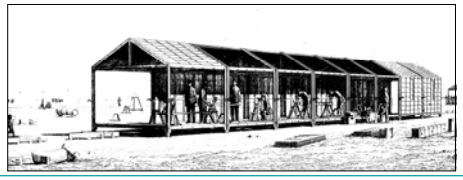
- The commercial and political rhetoric of standardisation
- The Meter Convention of 1875
- The missing role of geodesy and precision

Geodetic precision

- Two centuries of progress
- Improvement measured in orders of magnitude
- State-of-the-art in the 1850s: the Madrilejos base

The Madrilejos base





The Madrilejos base – reported results

- Probable error of 0.2 parts per million
- The best result of the 19th century
- Based on shaky foundations
  - Toise de Pérou
  - Borda module
  - Mètre des archives
- The need for a new meter

19th century precision in other fields

'Factories depended on finely measured, identical and interchangeable components just as laboratory physics depended on reliable, robust and universal constants'

Morus (2005)

Industrial precision

- Interchangeable manufacture
- Patterns and jigs, not measurement
- 19th century local standards
- 20th century international standards

Scientific precision

- Inadequate experimental techniques
- The speed of light
- Electromagnetic constants

Conclusion

- Geodesy was *the* precision science of the 19th century
- It was the first to expose the inadequacies of existing length standards…
- …and the catalyst for the Meter Convention and the reconstruction of the meter