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### Note

#### Comments on the papers:

#### Some comments on the history of vacuum microbalance techniques

by E. Robens, C. Eyraud, P. Rochas, *Thermochimica Acta*, 235 (1994) 135–144  
and

#### Some comments on the history of thermogravimetry

by C. Eyraud, E. Robens, P. Rochas, *Thermochimica Acta*, 160 (1990) 25–28

**W.-D. Emmerich** (Netzsch Gerätebau GmbH, D-95100 Selb, Germany): The first thermogravimetric apparatus of the Netzsch company was delivered 2.7.1959.

**R.C. Mackenzie** (3 Westholm Crescent South, Aberdeen AB2 6AF, Scotland, UK): Marcus Vitruvius Pollio comments about 27 BC in his *De Architectura* II v.3: “Whatever weight the limestone possessed when it is thrown into the kiln, it cannot answer to that when it is taken out; but when it is weighed, the bulk remaining the same, it is found to lose about one third of its weight.” (R.C. Mackenzie, *Thermochimica Acta*, 75 (1984) 251–306).

**W. Hemminger** (Physikalisch-Technische Bundesanstalt, D-38116 Braunschweig, Germany): In the 1850s thermobalances were probably used in several European cities which were trade centers for silk. In 1853, the Chamber of Commerce in Lyon ordered two dozen “dessicateurs Talabot-Persoz-Rogeat” from the Rogeat company in Lyon. Identical appliances were used in Marseille. (W. Hemminger, K.-H. Schönborn, A Nineteenth Century Thermobalance, *Thermochimica Acta*, 39 (1980) 321–323).

**C.J. Keattch** (Industrial and Laboratory Services, P.O. Box 9, Lyme Regis, Dorset DT7 3BT, UK): Another journal specialized in thermal methods is the Japanese *Netsu Sokutei*.

There are still extant weights of the period 2600 BC, from the area of Babylon, when Gudea was King. They were made of stone in the shape of geometric or animal figures, were marked with the size of the weight and also had sacerdotal seals. In 2300 BC King Dungi of Ur in Sumeria established probably the first institute for the testing of measures. It was presided over by the priests (see, for example, P. Walden, *Maß, Zahl und Gewicht in der Chemie der Vergangenheit*, Stuttgart 1931).

Cupellation can be regarded as the earliest example of a standard method of analysis and a detailed description is given in a statute of King Philip VI of France in 1343. Even the technique of weighing is described in detail mentioning "... whoever carries out the test must take care not to burden the balance by breathing upon it ..." (F. Hofer, *Histoire de la Chimie*, Paris 1866, Vol. 1, 499–500).

It should be emphasized that the first microbalance is generally attributed to Warburg and Ihmory who were working at Freiburg University investigating the weight and origin of water films forming on glass and other materials. The first photographic recording on a thermobalance was by Skramovsky (*Coll. Trav. Chim. Tcheosl.*, 5 (1933) 6–9), but the first photographic recording of weight changes was by Kuhlmann (W.H.F. Kuhlmann, Neue Wage zum automatischen photographischen Registrieren des Gewichtsverlustes einer Substanz, *Der Mechaniker*, 18 (1910) 13, 146–147).

**H.R. Jenemann** (Schwedenstr. 7E, D-65239 Hochheim, Germany): In the same year when Kuhlmann (Hamburg) described his photographic recording balance the competitive factory of Paul Bunge (Hamburg) exposed such an instrument at Brussels (*Katalog der Kollektiv Ausstellung der deutschen Präzisions-Mechanik und Optik*, Brüssel, 1910). Both recorded the declination of the beam for small weight changes and added weights by means of relay operated by a photo cell for bigger changes so that the balance was always operated at constant load.

The first recording balance is from Paul Stückrath, 1881. The declining beam touched an electrical contact which, via a relay and a spring driven clockwork, operated a stylus and successively sliding weights to compensate the weight changes. The stepwise contact operation was recorded as a function of time (Stückrath, Waage zur graphischen Aufzeichnung veränderlichen Gewichtes, *Zeitschrift für Instrumentenkunde*, 3 (1883) 95–99).

In the Odén–Keen balance of 1924, electromagnetic force compensation was used together with electro-mechanical weight switching (J.R.H. Coutts, E.M. Crowther, B.A. Keen, S. Odén, An automatic and continuous recording balance, *Proc. Royal Soc. Series A*, 106 (1924) 33–51).

For reference see H.R. Jenemann, Über die Grundlagen und die geschichtliche Entwicklung elektro-mechanischer Wägesystem, *CLB Chemie f. Labor u. Betrieb*, 36 (1985) nos. 8, 10, 12; 37 (1987) nos. 4, 5, 7, 12, esp. 36 (1985) 630–631.