

(suprastapedial), and the part loosely attached to the mandibular arch is the elongated extrastapedial. The short stylo-hyal afterwards coalesces with the body of the upper or incudal segment by an after-growth of cartilage (the *interhyal* tract); a long membranous space intervenes between it and the glossal piece (cerato-hyal.) Thus the "columella" of the Bird is formed of one periotic and three hyoidean segments.

In the Pig, the hyoidean arch is distinct, but articulates closely with the mandibular; its upper segment (hyo-mandibular) is converted into the incus, and becomes connected with the stapes. The stylo-hyal is dislocated and coalesces with the opisthotic region of the auditory capsule.

XIV. "Results of the Comparisons of the Standards of Length of England, Austria, Spain, United States, Cape of Good Hope, and of a second Russian Standard, made at the Ordnance Survey Office, Southampton." By Lieutenant-Colonel A. R. CLARKE, C.B., R.E., F.R.S., &c., under the direction of Major-General Sir HENRY JAMES, R.E., F.R.S., &c., Director-General of the Ordnance Survey. With a Preface and Notes on the Greek and Egyptian Measures of Length by Sir HENRY JAMES. Received May 21, 1873.

(Abstract.)

The following account of the results of the Comparisons of the Standards of Length of England, Austria, Spain, United States, Cape of Good Hope, and of a second Russian Standard at the Ordnance Survey Office has been drawn up by Lieutenant-Colonel Clarke, and is a sequel to the abstract of the results of the Comparisons of the Standards of Length of England, France, Belgium, Prussia, Russia, India, and Australia which the Royal Society has done us the honour to publish in the *Philosophical Transactions* for 1867, vol. clvii. p. 161.

The accurate determination of the lengths of the various standards employed by so many nations in the measure of the bases of their triangulations, which are now being united into one vast network of triangles, covering the whole of Europe, can scarcely fail to be of great importance for the advancement of physical science. To the comparison of these lengths I have added the result of our endeavours to recover the correct lengths of the most ancient measures of length with which we are acquainted, viz. those of Ancient Egypt, not only because our own measures are obviously derived from them, but also because we thus obtain the accurate relative value of the measures and distances given in the most ancient works on Astronomy and Geodesy which have come down to us.

The Ancient Egyptians employed two measures of length, viz. the common and the royal cubits.

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1st. As regards the *common cubit*, we have the statement of Herodotus that the Egyptian cubit was equal to the Greek cubit, "that of Samos;" and we learn from the measurements of the Hecatompèdon at Athens, by Mr. Penrose, that the Greek foot was equal to 1·013 foot, or 12·156 inches, and consequently the Greek cubit was equal to 1·520 foot, or 18·240 inches.

2nd. The most recent measures of the base of the First or Great Pyramid, that of King Cheops, viz. those made by the Royal Engineers and Mr. Inglis, a civil engineer, give a mean length of 9120 inches, or 500 cubits of 18·240 inches for the side of the square base, or 750 Egyptian feet, each Egyptian foot being equal to 1·013 English foot.

3rd. The Second Pyramid, according to the measures of Colonel Howard Vyse and Mr. Perring, has a base of 707·5 feet square, or $700 \times 1·011$ feet.

4th. The Third Pyramid has a base, according to Vyse and Perring, of 354·5 feet, or 350 Egyptian feet square, of 1·013 English foot exactly.

We may therefore confidently assume that 1·013 foot was the true length both of the ancient Greek and the ancient common Egyptian foot, and that the length of the *common Egyptian cubit* was 18·240 inches.

We have in the British Museum a double *royal cubit*, found in the ruins of the Temple of Karnak in Egypt; and I found its length to be 41·40 inches, and that of the single cubit consequently 20·70 inches, or 1·725 foot.

The pyramid which stands in the middle of the three, before the Great Pyramid (that of the daughter of King Cheops), has a base, according to Vyse and Perring, of 172·5 feet square, and therefore 100 royal cubits square exactly.

But the same authors give the breadths of no less than seven of the passages in the pyramids, including the entrances to the First, Second, and Third Pyramids, all of 41·5 inches (two cubits of 20·750 inches).

Doursther, from the measures of the nilometer at Elephantine and of three or four cubits found in the ruins of Memphis, which almost exactly correspond with each other, estimated the length of the royal cubit at 20·721 inches (see Condée, 'Dictionnaire des Poids et Mesures').

Looking to these facts, and feeling it almost certain that the common and the royal cubit had some definite relation to one another, like that between the link and foot of our own country (66 feet equal 100 links), I infer that the most probable length of the *royal cubit* was 20·727 inches, and that 88 *royal cubits* were equal to 100 *common cubits* of 18·240 inches.

This does not admit of rigid demonstration. The dimensions of Vyse and Perring seem to be given to the nearest half inch, and the measures of length sold in this country differ from one another as much as the length of the double cubit in the British Museum differs from its estimated length.