Yarkand Mission, Second. Scientific Results. Introductory Note and Map. 4to. *London* 1891; Aves, by R. B. Sharpe. 4to. *London* 1891. The Government of India.

Silver Medal, inscribed Johann Svatopluk Presl: Karl Bořivoj Presl. Mr. W. T. Thiselton Dyer, F.R.S.

Twenty-two Volumes, various, viz., seven vols. 4to and fifteen vols. 8vo. Also fifty-five parts of 'Philosophical Transactions,' and 217 Nos. of 'Proceedings of the Royal Society.' The Relatives of the late Mr. W. H. L. Russell, F.R.S.

January 28, 1892.

Mr. JOHN EVANS, D.C.L., LL.D., Treasurer, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "On the Melting Points of the Gold-Aluminium Series of Alloys." By W. C. ROBERTS-AUSTEN, C.B., F.R.S. Received January 25, 1892.

The author has already described and exhibited to the Society a new alloy of gold and aluminium, $AuAl_2$, which is remarkable for its intense purple colour.

The physical constants of the gold-aluminium alloys are being determined and the results will soon be ready for publication, but the series has been found to have one interesting peculiarity which deserves special mention. The author has shown ('Roy. Soc. Proc.,' vol. 49, 1891, p. 347) that the addition of 0·2 per cent. of aluminium to gold produces an appreciable fall in the freezing point, an addition of 0·4 per cent. causing a fall of 14·28°, or an "atomic fall" of 5·0° C.

These facts indicated that it was desirable to ascertain what are the melting points of the gold-aluminium series of alloys generally, and this has now been done with the aid of the Le Chatelier thermo-couple used in the way which was previously described (*loc. cit.*).

The results show that, although a white alloy, containing 10 per cent. of aluminium, has a melting point which is no less than 417° lower than that of gold; the purple alloy, on the other hand, melts

at a point which has yet to be definitely fixed, but which is several degrees above gold.* In fact, when workmen who are accustomed to melt gold on a large scale, attempt to melt this purple substance, they find it difficult to believe that they are dealing with a gold alloy, as it is so infusible.

The melting points of the rest of the series richer in aluminium appear to fall continuously to 660°, a little below the melting point of aluminium (665° C.).

The purple alloy presents the only case, known to the author, of an alloy, free from mercury, having a higher melting point than that of the least fusible of its constituents, and he considers that this fact affords strong evidence of its being a true compound of gold and aluminium.

It is generally admitted that there are true compounds in the copper-tin series, for $SnCu_3$ and $SnCu_4$ seem to be well defined, but their melting points are much lower than that of copper.

A. P. Laurie has just shown ('Phil. Mag.,' January, 1892) that in the gold-tin series, the alloy containing 63 per cent. of gold and 37 per cent. of tin has an electromotive force which distinguishes it from the rest of the series and points conclusively to its being a true compound, but the author finds that it melts readily below redness.

The melting points of ordinary chemical compounds are often much higher than the melting point of the least fusible constituent. *Galena*, for instance, melts at a strong red heat; it is difficult to fix the point accurately as the substance volatilizes, but it is close to 900° C. Its constituents, lead and sulphur, melt at 335° and 115° respectively. *Stibnite* also, sulphide of antimony, melts at about 530°, according to Dr. Joly, while antimony fuses at 440°.

The gold-aluminium series is of unusual interest, and well deserves careful attention.

* [Two very careful experiments were made, each with 40 grammes of the alloy, the cooling curve being traced by the autographic recorder already described ('Roy. Soc. Proc.,' *loc. cit.*). These curves gave 1065° and 1070° respectively as the melting point of the alloy $AuAl_2$, the mean of which is 32·5° higher than the melting point of gold. If, however, small quantities of the alloy be fused before the oxy-hydrogen blowpipe, it is easy to obtain a lower result, as aluminium is readily burnt out from the little mass. The composition of the alloy is thereby changed to one of the series richer in gold, of which the melting points are lower than that of gold.—Feb. 9, 1892.]