

cluding the Azores, Madeira, Canaries, and Cape de Verde Islands); (2) *Oriental*, or, rather, *Central and Oriental African*; (3) *Western African* (from the Gambia to the Congo); (4) *Southern* (included by a line drawn from Kalabini to Limpopo, and comprising a portion of the eastern coast to the Mozambique); (5) *Malagasic* (i.e. the Lemur country with Madagascar). Various expeditions and other means by which materials have been obtained are mentioned, and a bibliographical list is given, in the introduction, of the numerous published works and papers on African Arachnida from the days of Linnæus to the present time. The Arachnida described and recorded in this first part are from Tunis, while the second part (published *loc. cit.* vol. xvi. 1881) simply contains an account of a collection of Arachnids from Inhambane (in the southern region), with some considerations on the Arachno-fauna of the Mozambique, of which a list of species is also added.

The Tunisian collection described in Part I. numbers 115 species of six orders: *Scorpionidea*, 6 species (Scorpiones, 5; Pseudoscorpiones, 1); *Solpugidea* (Solifugæ), 4; *Phalangiidea* (Opiliones), 4; *Araneidea* (Araneæ), 96; *Acaridea* (Acari), 5. Of the above, two new genera, and eleven new species (all but one of the latter—a pseudo-scorpion of a new genus) belong to the Araneidea. As might be supposed, the essential character of the Tunisian collection is South European or Mediterranean. Very different from these are the arachnids described and recorded in Part II. from Inhambane and the Mozambique. Here we have, though the number of species is very scanty, the true tropical character. Only 54 species are recorded, comprised in 43 genera, 20 families, and 5 orders. The larger part (35 species) belong to the *Araneidea*, of which 1 genus and 4 species are new. Coming now to the Arachnida recorded and described in Part III. from Scioa (in the eastern zoological province) we have 71 species belonging to 49 genera, 18 families, and 4 orders. A general catalogue is also added of Abyssinian Arachnida, which, including those from Scioa, number 124 species. It is noted as remarkable that no scorpions were contained in the collection from Scioa, and that 30 of the Arachnids recorded are new to science; also that only 12 of the Scioan species are common to the rest of Abyssinia.

The author enters into some other considerations on the distribution of the Arachnids of Abyssinia; but the researches and materials on which his observations are based appear as yet to be too scanty to sustain any very general conclusions. At the same time it must be acknowledged that the plan on which the author has worked, of bringing the materials of so large and varied a region as the African peninsula under the geographical divisions announced in the introduction to Part I. is a most useful one, and the work he has done so far is undoubtedly a valuable contribution to arachnological science.

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#### MR. BURNHAM'S DOUBLE-STAR MEASURES

THE recently published volume of the *Memoirs of the Royal Astronomical Society* contains a further series of measures of double stars by Mr. S. W. Burnham, made with the 18-inch refractor of the Observatory at Chicago. This series comprises measures of 151 double stars discovered by this eminent observer, which brings up the number of such objects discovered by him during the last ten years to no fewer than 1013, amongst which are included some of the most interesting stars of this class; also measures of a selected list of double stars, 770 in number, made chiefly in the years 1879 and 1880, with an appendix, the results of observations of several objects, as late as the middle of the past year. Every one who is interested in this branch of astronomical science will read with much regret one

remark in Mr. Burnham's introduction: he writes:—"The present catalogue will conclude my astronomical work at least so far as any regular or systematic observations are concerned." He expresses himself modestly respecting his own labours—"In a field so infinitely large, one can accomplish but little at the most, and how much, or how little, the astronomers of a few centuries hence can perhaps best decide. . . . At this time I may venture to claim that my work in this field has been prosecuted with some enthusiasm, and for its own sake only, and that my interest has not been divided among several specialities."

But a higher estimate of Mr. Burnham's work in this particular line of observational astronomy to which he has devoted himself may be justly taken. To read of the discovery of upwards of a thousand double stars within a limited period by one observer, we might almost suppose we were living in the days of Sir William Herschel, when the heavens were comparatively an open field, and had not undergone the wide and close exploration which they had done when Mr. Burnham commenced his work. He has had, it is true, the advantage of instruments of the finest class, and we may believe an unusually acute vision; but he must have exercised an extraordinary and most meritorious amount of patience, perseverance, and care in the discovery and accurate measurement of such a list of double stars, and it will be gratifying to the astronomical world that such well-directed exertions have met with so exceptional a success.

Among the more noteworthy stars included in Mr. Burnham's new Catalogue (the fourteenth), which may be considered a continuation of that published in vol. xlv. of the same *Memoirs*, the following may be mentioned:—

1. 126 Tauri ( $\beta$  1007), "a most remarkably close and difficult pair, one of the closest known"; magnitudes 6.0 and 6.2. With a power of 1400 there was only a slight elongation.

2. B.A.C. 346; Mr. Burnham thinks the principal star may be variable, and he is certainly correct in his surmise. Heis gives it as a naked-eye star 6.7 m., Gould 7.0 m., and it has been several times noted 8 m.; while the writer has recorded it as low as 9 m.

3.  $\beta$  117; a star with a proper motion, according to Argelander, of 0".438; measures in 1883 show a common motion of the components; their distance is 2".2.

4.  $\zeta$  Sagittarii; detected by Winlock, probably a retrograde motion of 225° in less than fourteen years; and evidently a change of 48° in less than three years, by Mr. Burnham's measures alone. It is an object for large instruments in the other hemisphere.

5.  $\beta$  Delphini ( $\beta$  151).—A very rapid binary; since its detection by Mr. Burnham in 1873, there has been an increase in the angle of about 180°, and a diminution in distance from 0".6 to 0".25. He thinks "it may prove to have, with the single exception of  $\delta$  Equulei, the shortest period known."

Mr. Burnham collects the measures of  $\delta$  Equulei, and infers a period of revolution of about 10.8 years. Measures should be easy again in 1885.

6. 85 Pegasi ( $\beta$  733).—The close pair was not measurable in 1882; the angle was about 3.33" at the epoch 1883.75. The mean annual motion is about 12".5, at which rate the period would be less than thirty years.

In the introduction to the Catalogue will be found references to the publications where the thirteen previous ones are to be found.

#### MEASURING THE AURORA BOREALIS

THE study of the height of the aurora borealis above the earth's surface is, it will be easily conceived, of the greatest importance in understanding the nature of this phenomenon. Unfortunately the height of the aurora has always been, and is to some extent still, a moot point