heterogeneous, and that in places where it would hardly be expected. The result is nearly the same as found at Greenwich alone, 8∙8o6" =\*=0∙0026\*, or a mean distance of 92,830,000 m. = 1∙493×1013 cm. with an error which is as probably below as above 30,000 miles.

The sun’s distance enters into other relations, three of which permit of its determination, viz. the equation of light, the constant of aberration, and the parallactic inequality of the moon; the value of the velocity of propagation of light enters in the reduction of the two first, but as this is better known than the sun’s parallax, no disadvantage results. The equation of light is the time taken by light to traverse the sun’s mean distance from the earth ; it can be found by the acceleration or retardation of the eclipses of Jupiter’s satellites according as Jupiter is approaching opposition or conjunc­tion with the sun; a recent analysis shows that its value is 498∙6\*, which leads to the same value of the parallax as above, but the internal discrepancies of the material put its authority upon *a* much lower level. The constant of aberration introduces the sun’s distance by a comparison between the velocity of the earth in its orbit and the velocity of light. Its determination is difficult, be­cause it is involved with questions of the changing orientation of the earth’s axis of rotation. S. C. Chandler considers the value 20∙52" is well established; this would give a parallax of 8∙78\*. The chief term in the lunar longitude which introduces the ratio of the distances of the sun and moon from the. earth explicitly is known as the parallactic inequality; by analysis of the observations P. H. Cowell finds that its coefficient is 124∙75", which according to E. W. Brown’s lunar theory would imply a parallax 8∙778".

The best discussion of the sun’s apparent diameter has. been made by G. F. J. A. Auwers, in connexion with his reduction of the German observations of the transit of Venus of 1874 and 1882. It was found that personality played an important part; the average effect might be 1", but frequently it reached 3", 4", 5" or even 10", with the same instrument and method, nor was it fixed for the same observer. Some 15,000 observations, from 1851 to 1883, taken by one hundred observers at Greenwich, Washington, Oxford and Neuchâtel, cleared as far as possible of personal equation, showed no sign of change that could with probability be called progressive or periodic, particularly there was no sign of adhesion to the sun-spot, period. Better determinations of the actual value came from the heliometer, and gave an angular diameter of 31' 59∙26"±0∙10", and the value of the polar diameter exceeded the equatorial by 0·038" ±0·023". The conclusion is that the photosphere is very sharply defined and shows no definite departure from a truly spherical shape. Using the parallax 8∙80", the resulting diameter of the sun is 864,000 m. —1∙390×1011 cm.

If we regard the sun as one of the stars, the first four questions we should seek to answer are its distance from its neighbours, proper motion, magnitude and spectral type. In some respects the systematic prosecution, of these inquiries has only begun, and properly considered they involve vast researches into the whole stellar system. It would take us too far to treat them at any length, but it may be convenient to summarize some of the results. The sun’s nearest neighbour is *a* Centauri, which is separated from it by 270,000 times the earth’s distance, a space which it would take light four years to traverse. It is fairly certain that not more than six stars lie within twice this distance. No certain guide has been found to tell which stars are nearest to us; both brightness and large proper motion, though of course increased by proximity, are apparently without systematic average relation to parallax.

The sun’s proper motion among the stars has been sought in the past as the assumption that the universe of stars showed as a whole no definite displacement of its parts, and, on this assumption, different methods of reduction which attributed *apparent* relative displacement of parts to *real* relative displacement of the sun agreed fairly well in concluding that the “ apex of the sun’s way ” was directed to a point in right ascension 275°, declination +37° (F. W. Dyson and W. G. Thackeray), that is to say, not far from the star Vega in the constellation Lyra, and was moving thither at a rate of twelve miles per second. But recent researches by J. C. Kapteyn and A. S. Eddington, confirmed by Dyson, show that there is better ground for believing that the universe is composed mainly of two streams of stars, the members of each stream actuated by proper motions of the same sense and magnitude on the average, than that the relative motions of the stars with one another are fortuitous (see Star). This removes completely the ground upon which the direction of the sun’s way has hitherto been calculated, and leaves the question wholly without answer.

A star is said to rise one unit in magnitude when the logarithm of its brightness diminishes by 0∙4. Taking as a star of magnitude I α Tauri or α Aquilae, where would the sun stand in this scale ? Several estimates have been made which agree well together; whether direct use is made of known parallaxes, or comparison is made with binaries of well-determined orbits of the same spectral type as the sun, in which therefore it may be assumed there is the same relation between mass and brilliancy (Gore), the result is found that the sun’s magnitude is —26·5, or the sun is 1011 times as brilliant as a first magnitude star; it would follow that the sun viewed from α Centauri would appear as of magnitude 0∙7, and from a star of average distance which has a parallax certainly less than o∙1", it would be at least fainter than the fifth magnitude, or, say, upon the border-line for naked-eye visibility. We cannot here do more than refer to the spectral type of the sun. It is virtually identical with a group known as the "yellow stars,” of which the most prominent examples are Capella, Pollux and Arcturus; this is not the most numerous group, however; more than one half of all the stars whose spectra are known belong to a simpler type in which the metallic lines are faint or absent, excepting hydrogen and sometimes helium, which declare themselves with increased prominence. These are the white stars, and the most prominent examples are Sirius, Vega and Procyon. It is commonly though not universally held that the difference between the white and yellow stars arises from their stages of development merely, and that the former represent the earlier stage. This again is disputed, and there is indeed as yet slight material for a decisive statement.

*Summary of Numerical Data.*

Parallax : 8·806" ±= 0∙003".

Mean distance from earth: 92,830,000 m. = 1∙493×1011 cm. (Time taken by light to traverse this distance: 498∙6\*).

Diameter: Angular, at mean distance, 1919∙3".

Linear, 109×earth's equatorial diameter = 864,000 m.= 1∙390×1011 cm.

Mass: 332,000×mass of the earth.

Mean density: ∙256×mean density of earth = 1∙415.

Equator;inclination to ecliptic:.7° 15'.

Longitude of ascending node (1908∙0), 74° 28∙6'.

Rotation period ; latitude 0° : 24∙46°30°:26·43d 60°:29∙63d 80°:30∙56d

Solar constant, or units of energy received per minute per square centimetre at earth’s mean distance: 2∙1 calories.

Effective temperature, as an ideal radiator or “black body”: 6ooo° abs.

Bibliography.—Nearly all the chief data respecting the sun have lately been and still are under active revision, so that publications have tended to fall rapidly out of. date. . The most important series is the *Astrophysical Journal,* which is indispensable, and in itself almost sufficient ; among other matter it contains all the publications of Mount Wilson Solar Observatory (Professor. G. E. Hale), H. A. Rowland’s *Tables of Wave-Lengths,* many theoretical papers, and some reproductions of important papers issued elsewhere. But there are also papers which cannot be disregarded in *Monthly Notices* and *Memoirs of the Royal Astronomical Society,* and in *Astronomische Nachrichten.* S. P. Langley’s *Researches, on Solar Heat* are published by the War Department (Signal Service, xv.) (Washington, 1884), and Gill’s parallax researches in *Cape Annals,* vols. vi., vii. Auwer’s discussion of the sun’s diameter is in the discussion of the transit of Venus observations for 1874 and 1882. The best single volume upon the whole subject is C. A. Young’s *The Sun,* 2nd ed. (Inter. Sci. Series), and an excellent summary of solar spectroscopy, as far as rapid progress permits, is in Frost’s translation of Scheiner, *Astronomical Spectro­scopy* (1894). Scheiner’s volume, *Strahlung u. Temperatur d. Sonne* (1899), contains a great quantity of. interesting matter carefully collected and discussed. For authoritative declarations upon the latest moot points the *Transactions of the International Union for Solar Research* (Manchester) may be consulted, vol. i. having been issued in 1906, and vol. ii. in 1908. (R. A. Sa.)

SUN-BIRD, a name more or less in use for many years,@@1 and now generally accepted as that of a group of over 100 species of small birds, but when or by whom it was first applied is un­certain. Those known to the older naturalists were for a long while referred to the genus *Certhia* (Tree-creeper, *q.v.)* or some other group, but they are now fully recognized as forming a valid Passerine family Nectariniidae, from the name *Nectarinia* invented in 1881 by liliger. They inhabit the Ethiopian, Indian, and Australian regions,@@2 and, with some notable exceptions, the species mostly have but a limited range. They are considered to have their nearest allies in the Meliphagidae (see Honey-eater) and the members of the genus *Zosterops;*

@@@1 Certainly since 1826 (cf. Stephens, *Gen. Zoology,* vol. xiv. pt. 1, p. 292). W. Swainson *(Nat. Hist., and Classif. Birds,* i. 145) says they are “ so called by the natives of Asia in allusion to their splendid and shining plumage,” but gives no hint as to the nation or language wherein the name originated. By the French they have been much longer known as “ Souimangas,” from the Madagascar name of one of the species given in 1658 by Flacourt *as Soumangha.*

@@@3 One species occurs in Baluchistan, which is perhaps outside of the Indian region, but the fact of its being found there may be a reason for including that country within the region, just as the presence of another species in the Jordan valley induces zoographers to regard the Ghór as an outlier of the Ethiopian region.