From Table XLIX., p. 147, we extract :—

$$L' = +0\cdot013\ 67 \quad 2eP' = -0\cdot298\ 75$$
$$L'' = +0\cdot006\ 84 \quad 2eP'' = -0\cdot069\ 08$$
$$L_4 = +0\cdot023\ 51 \quad eP_4 = -0\cdot275\ 19$$

In Prof. Newcomb's value of L we think a small error (about 0·00020) has been introduced.

Now putting

$$\frac{a}{\mu}P_1 = K_c' \cos N_4\ 2p \cos N - C_c' \cos N_4\ 2q \cos N + D_s' \sin N_4\ k \sin N$$

we get

$$-\frac{d}{d(nt)}l_0 = (2K_c'L' - 2C_c'L'' = 2\lambda_1) \cos N_4 \cos N + D_s'L_4 \sin N_4 \sin N$$

$$-\frac{d}{d(nt)}\pi_0 = \left(2K_c'P' - 2C_c'P'' = \frac{2\pi_1}{e}\right) \cos N_4 \cos N + D_s'P_4 \sin N_4 \sin N$$

$$\frac{d}{d(nt)}\alpha = (-2K_c'a_0p + 2C_c'a_0q = 2a_2) \cos N_4 \sin N + D_s'a_0k \sin N_4 \cos N$$

$$\frac{d}{d(nt)}e = (-2K_c'e_0p + 2C_c'e_0q = e_2) \cos N_4 \sin N + D_s'e_0k \sin N_4 \cos N$$

At this point we shall reject the terms in $N + N_4$ and write

$$-\frac{d}{d(nt)}l_0 = (\lambda_1 + \tfrac{1}{2}D_s'L_4 = h_{l,c'}) \cos (N - N_4)$$

$$-e\frac{d}{d(nt)}\pi_0 = e(\pi_1 + \tfrac{1}{2}D_s'eP_4 = eh_{\pi,c'}) \cos (N - N_4)$$

$$\frac{d}{d(nt)}\alpha = (a_2 - \tfrac{1}{2}D_s'a_0k = h_{a,s'}) \sin (N - N_4)$$

$$\frac{d}{d(nt)}e = (\tfrac{1}{2}e_2 - \tfrac{1}{2}D_s'e_0k = h_{e,s'}) \sin (N - N_4).$$

Putting $\nu' = \dfrac{\text{mean motion of moon}}{\text{mean motion of } N - N_4}$

we obtain on integration

$$2\Delta e = -2\nu' h_{e,s'} \cos (N - N_4) = 2e_c' \cos (N - N_4)$$
$$2e\Delta\pi = -\nu' 2eh_{\pi,c'} \sin (N - N_4) = 2e\pi_s' \sin (N - N_4),$$

and by a double integration, remembering that $\Delta\alpha = -\frac{2}{3}\frac{\Delta n}{n}$,

$$\Delta l = \nu'\left(\frac{3}{2}\nu' h_{a,s} - h_{l,c'}\right)\sin (N - N_4) = l_s' \sin (N - N_4).$$

From p. 153 we extract

$$\nu' = 232\cdot729 \quad l_s' = +0''\cdot256$$
$$2e_c' = -1''\cdot158$$
$$2e\pi_s' = +1''\cdot164.$$

Lastly, if we substitute in

$$\delta v = \delta l + 2\delta e \sin g + 2 \cos g (e\delta l - e\delta\pi)$$

we get

$$\delta v = -1''.15 \sin (g + 2\pi - J).$$

Turning now to the statement of final results on pp. 156–9, we note, with the single exception of the Jupiter evection term, its mainly negative character. Results previously given by Radau and Brown are only very slightly modified, generally by quantities quite insensible to observation. Moreover, no explanation has been reached of the unknown term of long period. Thirty years ago Prof. Newcomb, in what are known as Newcomb's corrections, assigned a coefficient 15″·5 and a period of 273 years with an argument arising from the action of Venus to this unknown term. It is now known that the argument is impossible. The present writer thinks that both the coefficient and the period require some increase. At any rate, Newcomb's empirical term has now ceased to represent the observed motion of the moon. It is not, of course, to be expected that empiricism will predict with any accuracy for any length of time. In the last paragraph of his memoir, Prof. Newcomb recalls his attempt to establish an inequality in the earth's rotation that should simultaneously account for the motion of the moon and the transits of Mercury. About forty years ago there was an impression that planetary astronomy had been worked out by Hansen and Le Verrier. The lunar tables of the one and the planetary tables of the other marked immense advances on those of their predecessors, and the extant observations were not sufficient to sound any note of warning except that it might have been noted that Hansen's tables did not account for the ancient eclipses. We now have new planetary tables and the materials for new tables of the moon, but we cannot share the satisfaction of our predecessors of forty years ago. A very considerable list of residual phenomena has accumulated. Apses and nodes and secular terms do not accord with theory. In the moon some periodic terms are unexplained. In Mars it seems as if a term with one second as coefficient and period about twenty years is required to reconcile theory and observation. In the present memoir Prof. Newcomb has presumably excluded the action of the planets as a possible explanation of the vagaries of the moon.

A word ought to be said as to the excellent form of presentation of the subject by Prof. Newcomb. It illustrates the Roman maxim, so often quoted by the late headmaster of Eton, "Divide et impera"—subdivide into sections, and you will get the grip of it.

NEW FACTS ABOUT THE ARUNTA.

THE Arunta of Central Australia have loomed large of late in ethnological controversy, but we are destined to hear further discussion in the near future. Hitherto our information has been derived first from the observations of Mr. F. J. Gillen in part iv. of "The Report of the Horn Expedition to Central Australia," 1896, and later from the two well-known admirable books by Prof. Baldwin Spencer and Mr. Gillen. In a recent number of *Globus* (Bd. xci., No. 18, p. 285) Herr M. Freiherr v. Leonhardi has an article "On some Religious and Totemic Conceptions of the Aranda and Loritja in Central Australia," based upon information received from Herr C. Strehlow and Herr Reuther, of the Neuen Dettelsaur Mission, who have a mastery over the language of the Arunta, or Aranda. Some of the information thus obtained is so different from that recorded by Spencer and Gillen that it opens a new phase in the discussions concerning these remarkable people. Only the more salient points of Leonhardi's article can be here given; students will have to study it in detail, and they will await with eagerness the promised volume.

The Arunta certainly believe in a supreme, good, heaven-god called Altjira; he is the god of the upper world, and has little to do with men. He has the appearance of a tall man with a red skin and long hair falling over his shoulders, but he has feet like an emu, he eats vegetable food, and the flesh of the emu, which he spears. He is surrounded by beautiful youths and maidens, who are immortal. The stars are his camp-fires, the Milky Way his hunting-ground. Only certain specially conspicuous stars, such as the evening star, the Pleiades, &c., and sun and moon are ancestors of the Arunta, who once lived on earth and had certain totems. From this Altjira, who lives in heaven, and of whom no Tjurunga (Churinga) exists, must be clearly distinguished the ancestors, honoured as gods and endowed with superhuman powers, who lived on earth sometimes as animals, sometimes as men. In three neighbouring groups the supreme God is distinguished from the totem gods in the following way :—Dieri, supreme being, *Mura*, deified ancestors or totem gods, *Mura-Mura*; Arunta, supreme being, *Altjira* (the Uncreated), totem gods, *Altjira-ngamitjina* (the everlasting Uncreated) or *Intrara* (the Undying); Loritcha, supreme being, *Tukura* (the Uncreated), totem gods, *Tukutita* (the eternal Uncreated). Originally Gillen described a great spirit (*Ulthaana*), of whom no mention was made in the subsequent works, but in these "the most important spirit individual in the Arunta tribe is Twanyirika," though we are told he is not regarded "as a supreme being who in any way whatever was supposed to inculcate moral ideas." Neither is Altjira the guardian of cults and morals.

Herr Leonhardi writes:—"Among the most noteworthy of the discoveries of Spencer and Gillen was the idea that each man is the reincarnation of a totemic ancestor, and that after death, each soul returns to its totem centre, where the spirit individuals spend the time between the two incarnations. These child-germs enter the women, conception by means of men being unknown. In the neighbourhood of whichever totem centre a woman first feels pregnant, that becomes the totem of the child. I was not a little astonished when Herr Strehlow wrote that he could not find any reincarnation theory among the blacks, and that it must be a misunderstanding; but Spencer and Gillen are so positive, 'In every tribe without exception the belief in reincarnation is universal.'" Strehlow writes:—"I have made careful inquiries concerning the points raised. I have inquired of different blacks at different times, among others of three witch doctors, who are regarded as guardians of tradition, who grew up in heathendom. They all declare these ideas to be wrong. In different places there are numerous *ratapa* (origins of men, unborn men, who have body and soul, but are invisible). The male origins are in rocks, trees, or in the mistletoe growing on the latter; the female mostly in clefts in rocks. Each *ratapa* belongs to a certain totem, and the *ratapas* of the same totem are collected in one place. This was caused by the totem-ancestors 'getting tired' of their long wandering, and their bodies changed into rocks, trees, &c., and their souls collected in an underground cave. The child-germs are in these rocks and trees, and they go forth thence. If now a woman, who conceives, passes such a mistletoe branch or rock cleft, a *ratapa* enters as a grown youth or girl with body and soul, into her body, causing pains. The *ratapa* grows smaller in the woman's body until later it is born as a child. If an *apma* (snake) *ratapa* enters into a woman, the child belongs to the *apma* totem.

"When a man dies his soul (*etana*) goes, not to the totem centre, but to the island of the dead, where it remains for a time. Eventually it returns to its earlier dwelling place on the earth and says to its former friends, 'Be careful, lest you meet such a fate as mine!' If the dead man has left behind on the earth a small child, his soul enters into it and lives there until the child has grown up and has a beard, when the father's soul departs again, or it enters into his grandson in the same manner. It is finally destroyed by a flash of lightning. Thus one cannot speak of a reincarnation, but only of the temporary dwelling of the soul of the father or grandfather in his son or grandson." Strehlow assures Leonhardi that all the Arunta have the same belief.

"There are other means by which the children enter the women. The *atua ngautja* (souls of totem ancestors dwelling in underground caves) can also enter into the women, if they wish to return to this earth, though their final fate is utter annihilation. A child can enter its mother in animal or plant form. If a woman feels the first intimations of pregnancy immediately after seeing a kangaroo, which runs off and disappears, there is no doubt but that her child will be a kangaroo child.

"Each individual has relationship with two totems, he belongs to the one by birth, or rather by conception, this botem he calls *runga*. The other totem belongs to him, is bound up with him, has communion (*altja*) with him, so he calls it *altjira*. Thus the totem animal or plant of his mother which is forbidden to her to eat is his *altjira*, which belongs to him, of which he can eat as he will. A man named Ebalanga belongs to the iguana totem, so all iguanas are regarded as his friends, or even as his relations, for according to the ideas of the blacks he is himself an iguana. He may kill iguanas but sparingly, and eat only the tail and legs. The wild duck is his mother's totem, this is bound up with him, is his guardian, on whose flesh he feeds." As Leonhardi points out, "the great interest in these new facts is that we have here clearly a totem inherited through the mother. It may be that here is preserved a relic of earlier times, when the totem was inherited directly from the mother, as among so many other Australian tribes, and that the peculiar belief about the conception of children was a later development. As to the primitiveness of the Arunta and their neighbours, there has been much discussion, and the above facts may give new aspects to the controversy."

A word of warning seems desirable. The Arunta investigated by Herr Strehlow appear to have been Christianised, and some of their statements may have been influenced by the new teaching; also there may be slightly different beliefs among various sections of the Arunta. Doubtless these points will be fully discussed in the final publication. A. C. H.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—At the request of the special board for biology and geology, the general board is proposing to establish a demonstratorship in petrology. This demonstrator will be paid by fees, and not directly by the University.

The same board has also received a communication from the special board for biology and geology requesting that the title "Readership in Animal Morphology" (recently vacated by the election of Mr. Adam Sedgwick as professor of zoology) be changed to "Readership in Zoology." This will widen the subject of the readership so that it will include such subjects as variation and heredity, and will enable the University to provide for the teaching of these subjects, which for the last few years has been given by Mr. Bateson as deputy for the professor of zoology. The general board proposes that the annual stipend attached to the readership should be 100*l*., to be paid from a common university fund, and that the readership be attached to the board for biology and geology.

The Senate has sanctioned an alteration to the Previous Examination of some moment, although it excited no comment and little interest in the University. In future it will be possible for a candidate to take a paper on elementary heat and chemistry as an alternative to the papers on Paley's "Evidences" and elementary logic. In the same part of the examination a single combined paper on arithmetic and algebra will in future be set instead of the separate papers on those subjects.

There was a discussion last week on the proposal of the medical board to institute a third first M.B. Examination (chemistry, physics, and elementary biology) by holding one at the commencement of the October term. The proposal met with little opposition, though it was pointed out that the time of year was rather inconvenient. Supporters of the scheme hope that in time the October examination will largely take the place of the one held at present in December, and that the latter will ultimately disappear.

The electors to the Isaac Newton studentship give notice that the election to a studentship will be held in the Lent term, 1908. The studentships are for the encouragement of research and study in astronomy. Persons eligible are members of the University who have been admitted to the degree of Bachelor of Arts, and who shall be under the age of twenty-five on January 21, 1908. The studentship is usually of the value of 200*l*. per annum.

PROF. W. F. M. GOSS, one of the leading American authorities on railway engineering, has been appointed Dean of the college of engineering of the University of Illinois.

THE Civil Service Commissioners announce, in regard to open competitive examinations for clerkships in the Upper Division of the Civil Service, that, after next year, geography, treated scientifically, will be added to the list of subjects included under the head natural science of which four may be taken up.

A COURSE of eight lectures on the function of the mineral constituents of the soil in the nutrition of plants, by Mr. A. D. Hall, will be given, as part of the advanced lectures in botany of the University of London, in the lecture room of the Chelsea Physic Garden on Mondays and Thursdays, beginning on November 11 at 5 p.m. Dr. O. Rosenheim will give a course of three advanced lectures in physiology