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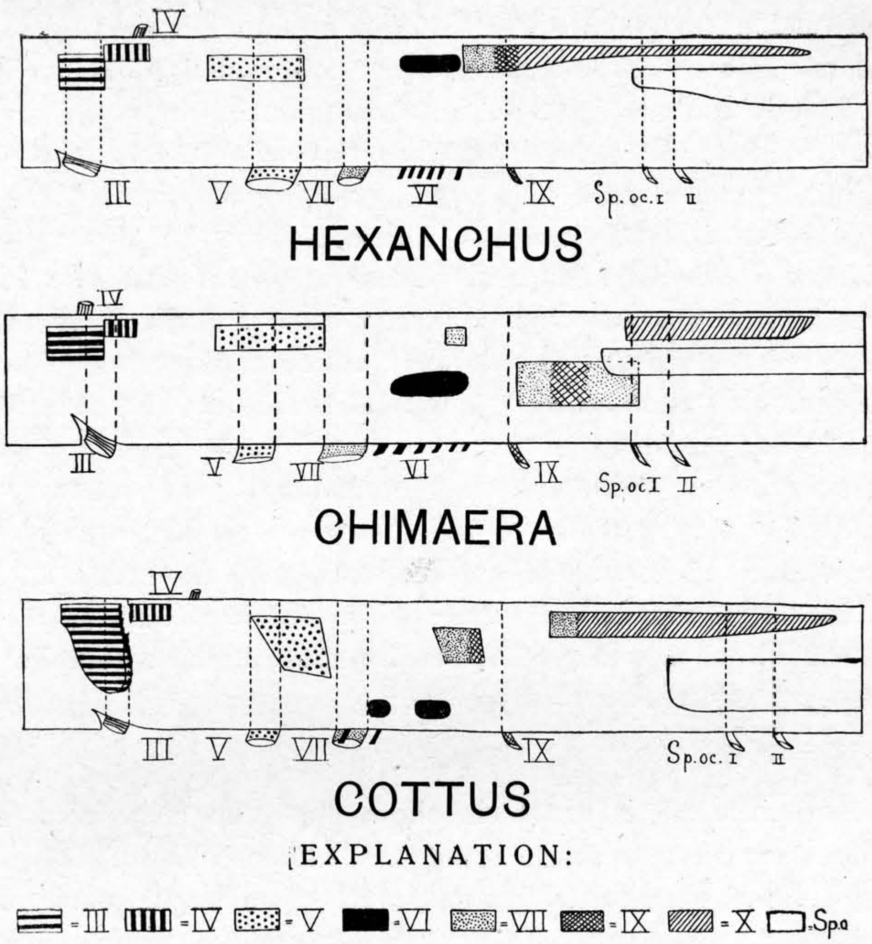

Topographic relation of the motor nuclei of midbrain and bulb in regard to the roots of the III, IV, V, VI, VII, IX and Spino-occipital nerves in a shark (Hexanchus) Holocephal (Chimaera) and a Teleost (Cottus).

Astronomy. — *Provisional results from calculations about the terms in the longitude of the moon with a period of nearly an anomalistic month, according to the meridian observations made at Greenwich*". By J. E. de Vos van Steenwijk. (Communicated by Dr. E. F. van de Sande Bakhuyzen).

(Communicated in the meeting of March 30, 1912).

In 1903 Prof. E. F. van de Sande Bakhuyzen had come to the conclusion that theory and observation did not perfectly agree about the so called Jovian evection in the longitude of the moon; nor had he been able to find in the observed places indications of another inequality of the same kind caused by Venus and the Earth [1]).

[1]) Proc. Acad. Amsterdam **6**, 1903 pp. 370 et seq. and 412 et seq.

The agreement as regards the Jovian evection was improved by the introduction of a corrected value found by HILL for the perturbations dependent on the ellipticity of the earth, and afterwards new theoretical calculations of the amplitude by NEWCOMB, HILL, and BROWN yielded a value agreeing very satisfactorily with the results of the observations [1]), but in the phase and hence in the length of the period a deviation seemed to remain.

Recently Prof. VAN DE SANDE BAKHUYZEN proposed that I should undertake a new investigation into this question founded on a longer series of Greenwich-observations than those used by him, and I gladly assented.

Since E. F. v. D. S. BAKHUYZEN had discussed the years 1895—1902, the first thing was now to take the years after 1902 in hand and further it was desirable to go back a little further than 1895, in order to have at our disposal the results of an uninterrupted series of eighteen years' observations. This work has been only just begun and if, notwithstanding this, I make bold to communicate already a few provisional results, this is owing to the desirability of deriving just now corrected places of the moon for the moment of the approaching solar eclipse.

I shall therefore communicate here the results of a provisional discussion of the 3 last years of the Greenwich-observations, which were at my disposal: 1907 up to 1909. I derived from it the co-efficients of the terms with *sin g* and *cos g*, which still had to be added to HANSEN's longitude of the moon and compared these with the sums of the corrections resulting from corrected values of the eccentricity and longitude of the perigee according to BAKHUYZEN and from the perturbations by the planets according to BROWN.

In my discussion of the observations I mainly followed the method indicated by NEWCOMB in his *Investigation* just as BAKHUYZEN had done; i. e. I employed as basis for my calculations directly the deviations in R. A. For the present, however, I had to be satisfied with a less rigorous course. The corrections of the co-efficients of the great perturbations I adopted from NEWCOMB's *Investigation* and as co-efficient of the parallactic inequality I employed the value which according to HANSEN's calculation would correspond to the solar parallax $8''.80$ (or $8''.796$), although this is no longer the case according to the more accurate calculation by BROWN. I did this because I could now use extant auxiliary tables, while the influence of this inaccuracy

[1]) NEWCOMB found $1''.15$, BROWN $1''.14$, while E. F. v. D. S. BAKHUYZEN had derived $1''.28$ from the observations.

on my results could not be but slight, since the periods of these terms are not commensurable with that of g.

An investigation into personal errors dependent on the age of the moon offered little chance of success, as I had only the observations of 3 years at my disposal. I therefore, after having corrected the observations as indicated above, only applied a mean correction to each category of observations in order to reduce the yearly mean of the differences comp.—obs. to zero. I employed all the observations made in the meridian including those obtained with the altazimuth and thus had for each of the two instruments three categories of observations, those of Limb I, of Limb II and of crater Mösting A, i. e. six in all. I formed for each of these the annual mean and subtracted this from the individual $\Delta\alpha$. I should certainly have done better by leaving out of account the observations made at an age of the moon less than $4^d.5$ and more than $25^d.5$ (comp. the former investigation by E. F. v. d. SANDE BAKHUYZEN), but of the 835 observations used, only 12 were in this case.

g	1907	1908	1909
0° — 20°	+ 0″87	+ 2″29	+ 2″23
20 — 40	+ 2.55	+ 2.12	+ 2.83
40 — 60	+ 2.29	+ 1.87	+ 2.33
60 — 80	+ 2.70	+ 1.02	+ 3.22
80 — 100	+ 3.18	+ 1.21	+ 0.67
100 — 120	+ 2.21	+ 2.28	+ 0.69
120 — 140	+ 0.93	— 0.36	— 0.57
140 — 160	+ 1.03	+ 1.20	— 0.60
160 — 180	— 0.63	+ 0.28	— 1.78
180 — 200	— 2.17	— 1.24	— 1.63
200 — 220	— 1.38	— 2.87	— 2.93
220 — 240	— 1.61	— 1.00	— 2.48
240 — 260	— 2.35	— 2.66	— 2.39
260 — 280	— 2.52	— 1.80	— 2.56
280 — 300	— 1.20	— 2.32	— 1.81
300 — 320	— 2.19	— 0.68	+ 0.92
320 — 340	— 0.54	— 1.07	+ 1.46
340 — 360	— 1.20	+ 1.88	+ 2.47

The thus corrected and reduced $\Delta\alpha$ (obs. — comp.) were now arranged for each year into 18 groups formed according to the value of the mean anomaly: from $g = 0°$ to $20°$, $20°$—$40°$ etc. The means found for those groups are found in the table on p. 1182.

The 18 results r obtained for each year have now been represented by equations of the following form

$$c + h \sin g + k \cos g = r$$

in which c stands for a constant deviation still extant in the results of the year under discussion, while

$$dl = - h \sin g - k \cos g$$

represents the correction to be applied to HANSEN's true longitude.

The weights of the values of r in one and the same year often differ considerably, and these weights have to be taken into account, if we wish to obtain a solution yielding the most accurate values of h and k. This has been done for 1909 but for the two other years the weights were momentarily neglected. Another solution was also made for 1909 without taking the weights into account and by comparing the results obtained in these two ways it appeared that the influence of the omission probably is not great. I obtained with and without weights for h resp. $+1''.81$ and $+1''.69$ and for k $+2''.17$ and $+2''.20$.

Adopting for 1909 too the solution obtained without weights the following values are to be regarded as the results of this first investigation:

	h	k
1907.5	$+2''.49$	$+0''.62$
1908.5	$+1\ .67$	$+1\ .06$
1909.5	$+1\ .69$	$+2\ .20$

It stands to reason that from the results of only 3 years no immediate conclusions can be drawn about the individual inequalities influencing the h and k. The only thing I could do was to compare my results with the co-efficients of $\sin g$ and $\cos g$ according to the complex of the element-corrections as derived by E. F. VAN DE SANDE BAKHUYZEN in 1903 and the perturbations as calculated by BROWN. I have extended this comparison of the empirical with the theoretical values of $-h$ and $-k$ to the years 1895—1902 discussed by VAN DE SANDE BAKHUYZEN [1]).

For the constant parts of $-h$ and $-k$ I adopted $-h_0 = -0''.43$ and $-k_0 = -0''.17$; and I borrowed the variable parts arising from the differences between the perturbations BROWN—HANSEN, from BATTERMANN *Beob. Ergebn. Berlin.* **13** p. 16—18. Of the perturbations by the planets we have to consider those numbered 23—29; the

[1]) Proc. Acad. Amsterdam **6**, 1903, p. 377.

terms 1—7 cannot contribute noticeably to the h and k, for reducing these to the form $a \sin (g+\chi)$, the annual variation of χ for N. 1 becomes 225°, for N. 5 330° and for the rest of the terms > 360°. Further, of the perturbations by the sun N. 39 has to be taken into account and of those owing to the ellipticity of the earth N. 44.

These 9 terms calculated for the middle of each year were reduced to the form $a \cos \chi \sin g + a \sin \chi \cos g$, so that we obtain as computed values

$$(-h)_{comp.} = -h_0 + \Sigma\, a \cos \chi \text{ and } (-k)_{comp} = -k_0 + \Sigma\, a \sin \chi.$$

The following table contains the values deduced from the observations $(-h)_{obs.}$ and $(-k)_{obs}$ and the differences $(-h)_{obs.} - (-h)_{comp.}$ and $(-k)_{obs.} - (-k)_{comp.}$.

	$(-h)_{obs.}$	$()_{obs.}-()_{comp.}$	$(-k)_{obs.}$	$()_{obs.}-()_{comp.}$
1895.5	− 0″29	+ 0″23	− 0″44	+ 0″43
1896.5	− 0.66	− 0.58	− 1.16	+ 0.57
1897.5	− 0.57	− 1.09	− 1.77	− 0.16
1898.5	− 0.51	− 1.01	− 2.10	− 0.49
1899.5	+ 0.93	− 0.28	− 2.83	− 1.13
1900.5	+ 1.66	− 0.01	− 1.12	− 0.50
1901.5	+ 1.46	+ 0.38	− 0.52	− 0.73
1902.5	+ 1.18	+ 0.33	− 0.01	− 0.59
1907.5	− 2.49	− 0.04	− 0.62	− 0.61
1908.5	− 1.67	+ 0.28	− 1.06	+ 0.07
1909.5	− 1.69	− 0.48	− 2.20	− 1.05

We now see that the differences between observation and computation have still a systematic character. Yet we cannot deduce from this comparison with any certainty an empirical correction to the computed longitude of the moon for the moment of the solar eclipse of April 17. For that moment we have $g = 278°$, so that especially the value of h is of importance and it does not seem feasible to extrapolate a value of $(-h)_{obs.} - (-h)_{comp.}$ for 1912.3.

Prof. E. F. v. d. Sande Bakhuyzen's opinion, (comp. J. Weeder, Calculations etc., Proc. Acad. Amst. **14** p. 950), based on his former calculations, that the real value of $-h$ would probably be at least $-0''.6$ greater than the computed one, is therefore not corroborated by the results I have obtained thus far.