work was re-examined, and if necessary carried to a further degree of approximation. The following Table gives the coefficients adopted for the principal inequalities, Cowell's values being given for comparison :—

	New Tables.	Cowell.
Evection	4586″·32	4586″·4
Variation	2369 ·95	2370 ·2
Principal Elliptic Term ..	22639 ·75	22639 ·5
Annual Equation	−668 ·92	−668 ·2
Parallactic Inequality ..	−125 ·10	−124 ·9

For the parallax 3422″·70 is used, practically the same as Newcomb's gravitational value 3422″·68 ; Hansen used 3422″·24. For the mean semi-diameter they use 933″·60, exactly the value deduced by Cowell from the Greenwich observations. Hansen had used 934″·07, which is evidently too large. The value deduced by occultations is 932″·65.

The new tables diminish Hansen's mean motion by 27″ per century, and his acceleration by 4″·48, making it 7″·7.

Newcomb's empirical term of 273 years is not used, but the two following empirical terms are substituted :—

$$+11''\cdot5\cos[1^\circ\cdot37\,(t-1790\cdot5)].\quad\text{Period 263 years.}$$

$$+3''\cdot3\cos[5^\circ\cdot6\,(t-1856\cdot5)].\quad\text{Period 64·3 years.}$$

It is suggested that the former term may arise from a swarm of tiny planets within the orbit of Mercury, their period being almost a sidereal month. It is stated that a mass one-fifteenth of that of Mercury would suffice.

These new Tables are to be used in the *Connaissance des Temps*, beginning (we believe) with the year 1914. The *Nautical Almanac* will not use them owing to the fact that Brown's Tables are so nearly ready. When both Tables are in use a comparison of the two ephemerides should make it easy to detect any small errors that may lurk in either. A. C. D. C.

NOTES.

Comet Notes.—The following elements of Comet 1911 *h* (Schaumasse) are by M. G. Fayet from observations on Nov. 30, Dec. 1 and 2 :—

T	1912 Feb. 5·347 Paris M.T	
ω	109° 7′·6	1911·0.
Ω	115 12·1	
i	20 29·4	
log q	0·06822	

Ephemeris for Paris Midnight.

	R.A.			S. Dec.			R.A.			S. Dec.	
	h	m	s	°	′		h	m	s	°	′
Jan. 5....	15	34	51	2	47	Jan. 21....	16	45	24	6	17
9....	15	52	22	3	43	25....	17	2	58	7	2
13....	16	10	2	4	37	29....	17	20	23	7	43
17....	16	27	44	5	28	Feb. 2....	17	37	31	8	21

The comet will be brightest (about 10th mag.) at the end of January.

Several observations of Borrelly's Comet are reported during December. It was of the 8th or 9th magnitude, easily visible in moderate telescopes, and showed indications of a short tail.

Brooks's Comet was observed by Dr. Ristenpart at Santiago, Chili, on Dec. 9. It was then of magnitude $7\frac{1}{2}$.

M. Kamensky gives in *Ast. Nach.* 4543 the following revised elements of Wolf's Comet :—

Epoch and Osculation 1912 Feb. 11·0 Berlin M.T.

M	358° 9′ 9″	1912·0.
π	19 29 46	
Ω	206 39 35	
i	25 15 58	
ϕ	33 55 0	
μ	521″·4813	

He gives an ephemeris for the spring of 1912, but estimates that the magnitude of the comet will then be only 14.

A. C. D. C.

Minor Planet Notes.—The following discoveries have been made :—

Planet.	Date.	Discoverer.	Place.	Mag.
LZ^a	1911 May 24	Lowell.	Flagstaff, Ariz.	13·5
NL	Nov. 22	Metcalf.	Winchester, Mass.	13·5
NM	22	,,	,,	12·5
NN	26	,,	,,	13

A. C. D. C.

Obituary.—Besides the death of Mr. W. T. Lynn, mentioned on another page, we have to record with regret the death of Mr. Arthur Cottam, which happened, after a long illness, at Bridgwater on November 23. Mr. Cottam was elected a Fellow of the Royal Astronomical Society on February 14, 1862, at the same Meeting as Mr. Lynn, and the two gentlemen were not far removed in age, for Mr. Cottam was in his 76th year at the time of his death. He contributed a short note to the 'Monthly

Notices' on an observation of the companion to Antares in 1866, and in the year 1889 he published an excellent series of large-scale charts of the northern constellations from the Pole to 40° South Declination. Mr. Cottam was an original Member of the British Astronomical Association, and acted as one of the Secretaries during the first two years of its existence.

The deaths are also announced of two other Fellows of the Royal Astronomical Society, the Rev. DUNNE PARKER, of Stevenage, Herts, and Mr. WEGG-PROSSER, of Hereford. We do not know the exact age of the first of these gentlemen, but he was evidently over 70. Mr. Wegg-Prosser was 87 at the time of his death. Considering this in connection with the ages of others whose deaths we have recorded during the past year—Dr. Johnstone Stoney 85 and Mr. Coleman 87,—it will be seen that the average age at death of these six astronomers is more than 80.

We also see with regret the announcement of the death of Dr. GEORGE DAVIDSON, of San Francisco. Dr. Davidson was born in Nottingham and went to America when a boy, subsequently joining the staff of the U.S. Coast Survey as astronomer. He established a private observatory at San Francisco in 1878. Dr. Davidson contributed several papers to the 'Monthly Notices,' his earlier ones relating particularly to survey work, and others to the observation of occultations of stars by the Moon, one on anomalous phenomena seen at occultations, communicated in 1890, being especially noteworthy. Dr. Davidson also lived to an advanced age, for he was 86 at the time of his death.

Since the above notes were written, announcement has been made of the death of the distinguished mathematical astronomer M. R. RADAU, of Paris, at the age of 76. M. Radau was elected to the Astronomical Section of the Paris Academy of Sciences in succession to Tisserand in 1897, he was an Astronomical Member of the Bureau des Longitudes, and in 1905 was elected an Associate of the Royal Astronomical Society. He was one of the Editorial Committee of the *Bulletin Astronomique*, to which publication he was a frequent contributor, and he also wrote articles in the *Revue des Deux Mondes* and other semi-popular scientific journals, one in the *Moniteur Scientifique* of 1865 November, "Sur les Erreurs Personnelles," being a valuable history of the subject. He published, among other works, 'Mémoires d'Astronomie,' 'Les Planètes au-delà de Mercure,' and 'Le Spectre Solaire.' A notice of the New Tables of the Moon, based on Delaunay's theory, by M. Radau, appears on another page of this number.

RECENT RAINFALL.—The total rainfall at Greenwich during the three months October, November, and December was respectively 3·299 in., 3·422 in., and 4·020 in., the sixty years' average for these months being respectively 2·782, 2·220, and 1·827 inches. It will be seen on reference to our October number that the

four months June to September together showed a deficit of nearly 4 inches, so that this has been compensated, and the total Greenwich rainfall for 1911 is 23·658 inches, the average for the sixty years 1851–1905 being 24·132. The total sunshine for the year has been 1789·1 hours, being in excess of the average 1502. The mean temperature for the month was 44°·5, which is about 4°·5 above the average.

β AURIGÆ AS A VARIABLE STAR.—Mr. Joel Stebbins, of the Illinois Observatory, is making a study of eclipsing variable stars, that is, stars of the Algol type, and from a series of observations with a selenium photometer made between 1910 October 2 and 1911 March 22, he has found that β Aurigæ is an eclipsing variable, the variation caused by eclipse being only 0·076 magnitude, with an additional change of 0·011 magnitude due to the ellipticity of figure of the two components, making a total range of 0·087 of a magnitude. The total period is 95·04 hours. Details of the observations and method of the investigation will be found in the *Astrophysical Journal* for September last.

THE following are the titles of Mr. Lynn's books, taken from the list of Messrs. Bagster & Sons, 15 Paternoster Row, his publishers:—

	s.	*d.*
Celestial Motions, 12th edition	2	0
Remarkable Eclipses, 11th edition	0	6
Remarkable Comets, 15th edition	0	6
Astronomy for the Young, 6th edition	0	6
Remarkable Eclipses and Comets, in 1 vol., cloth	1	0
Studies in the New Testament	1	6
Eminent Scripture Characters	1	0
Bible Chronology	1	0
New Testament Chronology	0	4
The Concise Chronology	0	3
The Penny Chronology.		

THE GRESHAM LECTURES.—Mr. S. A. Saunder will give his next series of lectures on January 16, 17, 18, and 19 at the City of London School, Victoria Embankment, at 6 P.M., the subject of the course being "Eclipses." These lectures are given to the public, in pursuance of the will of Sir Thomas Gresham, without charge.

THE Académie des Sciences has awarded the Lalande Prize to Prof. Lewis Boss for his General Catalogue of 6188 stars; the Valz Prize to M. Rambaud, Aide-Astronome of the Algiers Observatory, for general observation; the Prix G. de Pontecoulant to M. L. Schulhof, for his various works of computation, principally relating to the theory of comets; and the Damoiseau Prize jointly to MM. Millosevich, Witt, and Lagarde, for their several works

in connection with the determination of the Solar Parallax from the observations of Eros. It may be remembered that the Leconte Prize was awarded last year by the Academy to Mr. Hinks for this work, and it is thought well to supplement this by awarding prizes to those who had facilitated his work.

In the account of the Meeting of the Astronomical Conference at Paris in our November number (p. 413), which was compiled in some haste, the names of some of those who attended were omitted. We add to the list already given the names of Comte de la Baume Pluvinel, Prince Roland Bonaparte, l'Abbé Verschaffel (d'Abbadia), MM. André (Lyons), Bigourdan, Deslandres, and Hanusse.

From a letter in *l'Astronomie* for November it is to be gathered that an official order has been issued that clock-makers, electricians, and others in France shall not set up apparatus to receive the time-signals now sent out by wireless telegraphy from the Paris Observatory; but we give this with reservation, not knowing precise details.

It appears that, on the suggestion of the Editor of our valuable contemporary *Popular Astronomy*, a Variable Star Association has been formed in America on the lines of the B. A. A. Variable Star Section, which we wish every success. Mr. W. T. Olcott is the Corresponding Secretary.

The programme of lectures at the Royal Institution for January comprises two by Prof. A. W. Bickerton, to be delivered on Thursdays, January 18 and 25, at 3 P.M.

The next Meeting of the Royal Astronomical Society will be on Friday, January 12; of the British Astronomical Association on Wednesday, January 31.

From an Oxford Note-Book.

The inaugural lecture of Prof. Sampson in the Chair of Practical Astronomy at Edinburgh appears in a form which suggests that it has only been printed for limited circulation. If so, this is matter for regret, since it is well worthy of a wide circulation. It is unjust to take extracts from it, but I cannot forbear one or two:—

> There is one advantage which astronomy enjoys over all other arts, and even in a greatly predominant degree over other sciences, which is quite priceless to it, though I do not know that it has ever evoked any lyrical or other adequate expression of its debt. I refer to its subjection to arithmetic. We can never go far astray in astronomical theory without running up against a stone wall. . . . . Even mathematical researches are hardly adopted in astronomy unless they are so framed that they end in numbers. It is because its final appeal is

always to arithmetic, and that its geometrical subject-matter makes this appeal practicable, that astronomy is unapproachable by the other sciences in its range as well as in its certainty. How different would have been the history of Philosophy, let us say—the Mother of Sciences,—if she had had such a friend at her elbow to deal faithfully with each error as it arose. She would not then be still engaged, as she is now, in discussing the paradoxes of Zeno of Elea.

And again :—

The stars are impressive enough at a glance, but without reasoning they are merely an interesting panorama, with no direct lesson to read to us; for all that it is so certain and so great, the whole scheme of our true relation to them exists in and of the mind. Therefore man is not less than the universe but greater, because he has created it of the substance of thought within his own mind. So far as it concerns him, he has called it into being by thinking it, where he need never have thought at all.

ALONGSIDE this second extract we may put one which caught my eye in a review of Mr. Garrod's 'Manili Astronomicon,' Lieber II. (Oxford Clarendon Press, 10*s.* 6*d.* net) :—

Again, both men and animals are subject through God (*Ratio*) to celestial influence :—

"How, beholding this, should one hesitate to link man with the heaven? Nature has given to him forethought and speech and apt intelligence and swiftness of spirit. Into him alone has God descended and dwells in him and seeks himself in man's seeking of him. I say nothing of other arts that are permitted to us, albeit uncertain, gifts beyond our competence. I pass by the fact that nothing is given to us perfect in law and order, that our guides, as is clear, are not men of all-surpassing mind. I pass by the fact that fate is sure and inevitable, and that it belongs to matter to endure—and to the universe to exercise—compulsion. But yet—who could avail to know the heavens except by the boon of heaven, who to find God save one that is himself a portion of the gods?"

We must give the last two lines in the original; they are the ones quoted by Goethe :—

"Quis caelum posset nisi caeli munere nosse
Et reperire deum, nisi qui pars ipse deorum est?"

THE following brief extracts from Herschel's papers show how the idea of the stoppage of light in space was working in his mind (italics ours) :—

From the description of these nebulæ, we find that an actual nucleus has been formed in the attracting center; and that consequently a certain degree of consolidation of the nebulous matter is highly probable; for, although the quality of shining only points out the existence of something that is luminous, yet from analogy we have reason to conclude that certain material substances must be present to produce the light we perceive; and that they must be *opaque* may be inferred from every thing we know about shining substances.—*Reprint*, vol. ii. p. 482.

A second remark I have to make is, that the *opaque* nature of the nebulous matter which was before inferred from analogy, is here supported by observation; for these consolidated nuclei have a considerable resemblance to the disks of planets, &c.—*Ibid.* p. 483.

If then the former nebulosity of the two stars which have ceased to be nebulous can only be ascribed to an effect of the transit or penetration of their light through nebulous matter which deflected and scattered it, we have now a direct proof that this matter can exist *in a state of opacity, and may possibly be diffused in many parts of the heavens without our being able to perceive it.*—*Ibid.* p. 491.

And the following is a very close anticipation of certain modern views on the formation of the tails of comets :—

And if we suppose the attenuation and decomposition of this matter (in the head and envelope of a comet) to be carried on till its particles are sufficiently minute to receive a slow motion from the impulse of the solar beams, then will they gradually recede from the hemisphere exposed to the Sun, and ascend in a very moderately diverging direction towards the regions of the fixed stars.—*Ibid.* p. 511.

It is only fair to quote an instance where Herschel's wonderful sagacity went wrong :—

Now to suppose that the largest stars should really have the smallest motions, is too singular an opinion to be maintained.—P. 349.

At a secondhand-bookstall the other day was found 'The General History of the Air, designed and begun by the Hon. Robert Boyle, Esq., June 29, 1692.' There was not much of great interest, but in an early meteorological register for 1666–7, "kept by Mr. Locke in Oxford," there is an entry on Sept. 4^{d} 13^{h} :—"Dim reddish sunshine" [apparently civil time beginning at midnight was used then], and the further note :—

This unusual colour of the Air, which without a Cloud appearing made the Sun-beams of a strange red dim Light, was very remarkable. We had then heard nothing of the Fire of *London*; But it appeared afterward to be the smoak of *London* then burning, which, driven this way by an Easterly wind, caused this odd Phenomenon.

Some weeks ago I received a postcard predicting a magnetic storm for about 5 o'clock on December 11. No indication was given of the method of prediction, and the inherent scepticism of human nature suggested a rapid way of dealing with the matter. But to give curiosity a chance I ventured to notify the Astronomer Royal. On December 12 I got a postcard from him :—"The magnetic storm which was predicted occurred yesterday. As they are at present rare, this is very remarkable." Naturally this prompted a respectful enquiry at the fountain-head, and I received in reply the following letter; the advertisement referred to has, I fancy, already appeared in these notes, but being at the moment away from references, I cannot verify this :—

Dear Sir,—

I am in receipt of yours of even date, for which I have to thank you. I have no wish to keep my discoveries a secret; indeed, considering their importance, it would be wicked to do so. I shall be prepared to state all I

know in answer to any reasonable request—say, in reply to a joint request from six members of the Royal Astronomical Society. In the meantime, I may refer you to enclosed copy of my advertisement inserted in the *Times* of 13th February last, which will give some primary idea of my method; but, of course, the whole matter is not exhibited there.

I would also like to say that I have no objection to your putting my prediction into print.

GREAT DISCOVERY
of
THREE ULTRA-NEPTUNIAN PLANETS,
which are situate and have been named as under:—

Name.	Present Position Heliocentric Longitude.	Present Rate of Motion.	Approximate Period of Revolution.
Conception	184° 28′	1° 8′ per year.	315 years.
Devotion	149 13	0 34 ,,	630 ,,
Adoration.....	250 42	0 17 ,,	1260 ,,

Earth, Mars, Jupiter, Saturn, Conception, and Devotion have a direct rotation. Mercury, Venus, Uranus, Neptune, and Adoration a retrograde rotation. A comet is created as a consequence of a conjunction of a direct rotating planet outside Earth with an outside retrograde planet; and sometimes—according to position—at a conjunction of two outsiders of same rotation.

Other natural phenomena, as sun-spots, magnetic and seismic disturbances, can be explained with the assistance of the three additional planets.—A. H., H. 587, *The Times* Office, E.C.

Now what is the right philosophic attitude in this situation? It is easy enough to be sceptical; indeed, it is very difficult to keep, not exactly an open mind, but a sufficient crack of the door open to admit the possibility of there being "something in it." And yet stranger things have happened. Can we muster six sufficiently imbued with the spirit of enquiry? It is below even the lowest figure to which Abraham gradually descended in respect of righteous men. [But the intended enquiry has meantime been rendered unnecessary.]

A CORRESPONDENT kindly sends me the following extract from Decharme's 'Mythologie de la Grèce Antique' (p. 237):—

Cette Constellation (Orion) se lève au moment du solstice d'été pour disparaître au commencement de l'hiver. Orion est donc l'astre brillant de la belle saison de l'année, à laquelle il emprunte son nom. Pendant toute la durée des nuits d'été les yeux sont frappés de son puissant éclat.

We have known Aquila mistaken for Orion, but this could scarcely explain the whole of the above passage.

Two extracts from examination papers:—

The rays from various metals in a state of incandescence have already been taken and certain lines are formed which can be compared in colour and shape with the Solar Spectrum. When a line in the Solar Spectrum compares with that of a known metal, then we know that the Sun contains that metal. So with the Stars. The Sun contains nearly all minerals found on the Earth, and another called Argon. The Moon reflects the light of the Sun, and its light contains the most easily reflected rays of the Sun. A nebula is sometimes of a ruddy hue and sometimes of a blue tint; this depends on the presence of special metals in a gaseous state.

* * * * *

The "Milky Way," as it is denominated, is an apparent dark path amongst the stars bordered by a vast concourse of stars, far transcending the groups in other parts of the heavens. There are many mythical stories explaining this wondrous spectacle. In some legends it is described as having been caused by a runaway horse and chariot driven by a reckless son of one of the gods. The mad career of the war-cart causing great devastation and ruin amongst the stars, leaving an almost clear path through the heavenly jewels.

A KIND correspondent has sent me the *Battle Creek Enquirer* for November 12 last, which prints the long dream of a Battle Creek man who went fishing and was suddenly invited by a stranger to see where the "dead were till the last day." The notion is an original one:—

I was looking at the Earth, revolving on its axis; continents and seas coming into sight on the one side and disappearing on the other, clouds obscuring a part, sunshine covering a greater part. My attention was called to objects leaving the Earth. Then I was shown the same objects nearer, and we moved close to see what they were. Human forms, young and old, the dead of Earth, as they floated off, no regard as to perpendicular.

I asked the reason for the strange positions, and he said it was just as the body lay when the spirit left it; if lying down, the form took the same position in the wake of the Earth.

The Earth is about 25,000 miles in circumference. Each took the relative position they had on Earth, some placed in a circumference of about 8,000 miles in diameter, as the Earth moves ahead about 19 miles a second, and there is a death every second on Earth. These forms were left far apart, even if they seem to us to die together.

The Earth has a motion around the Sun. Diameter of some 185 millions of miles, moving ahead about 18 miles per second, and our sun and all the planets have a forward motion of about $51\frac{3}{6}$ miles per second. Now, if you will imagine a big coil of lead pipe pulled apart about equal to its diameter, you can imagine the track of the Earth around the Sun; also its forward motion, that makes a circular tube through which our Earth has passed, and I was permitted to see and go to several parts of that immense path, and through it all, human forms are waiting for the last day, and this is the reason why a spirit cannot go back to Earth.

First he showed me my father, who passed from the Earth about 10 years ago, 10 times 166 millions of miles from the Earth back in its wake. I said: "He does not look like father; father never wore whiskers." He said the cutting off of whiskers or a limb, or the destruction of the human body did not affect the spirit. All the spirits I saw were beautiful.