rigorous, and are liable to accidental errors of one or two seconds.

$C - O$.

Date, Greenwich mean time.	Observatory.	$\Delta\alpha \cos\delta$.	$\Delta\delta$.
Sept. 3.6	Harvard	[+ 21″	— 3″]
" 4.7	Harvard	+ 9	— 6
" 4.7	Harvard	[+ 23	— 3]
" 4.7	Harvard	[+ 22	— 2]
" 5.4	Kiel	— 10	+ 14
" 5.5	Albany	— 3	— 7
" 5.5	Harvard	[+ 12	+ 4]
" 5.5	Wien	— 4	+ 1
" 5.6	Albany	— 3	+ 11
" 5.6	Cincinnati	0	+ 12
" 5.6	Leiden	— 2	+ 10
" 6.4	Königsberg	[+ 12	— 26]
" 6.4	Dun Echt	— 2	+ 3
" 6.5	Harvard	[+ 12	+ 5]
" 6.6	Albany	— 3	+ 2
" 6.6	Albany	— 5	+ 10
" 6.6	Harvard	— 1	— 10
" 6.6	Cincinnati	+ 3	+ 3
" 6.8	Harvard	[+ 22	0]
" 7.3	Wien	+ 5	+ 4
" 7.4	Kiel	— 4	+ 1
" 7.5	Harvard	[+ 17	+ 10]
" 8.4	Leiden	— 3	— 3
" 8.4	Dun Echt	— 4	— 9
" 9.3	Pulkowa	+ 3	0
" 9.4	Kiel	— 2	+ 2
" 9.5	Strasburg	— 1	— 3
" 9.6	Albany	— .1	— 2
" 9.6	Harvard	+ 2	— 15
" 10.4	Pulkowa	+ 4	+ 2
" 10.5	Kiel	— 1	+ 6
" 10.5	Dun Echt	+ 1	+ 1
" 10.5	Strasburg	+ 2	0
" 10.8	Cincinnati	+ 7	+ 5
" 11.5	Kiel	— 9	+ 5
" 11.6	Dun Echt	— 5	+ 5
" 17.3	Pulkowa	+ 6	— 3
" 18.5	Albany	— 1	+ 7
" 19.3	Kiel	0	— 1
" 19.4	Strasburg	— 3	— 4
" 21.4	Strasburg	— 1	— 5
" 21.6	Albany	— 3	+ 1
" 21.6	Albany	0	— 7
" 22.3	Königsberg	— 1	+ 6
" 23.3	Wien	— 5	— 2
" 23.3	Kiel	— 6	— 2
" 25.4	Leiden	— 3	+ 6
" 25.6	Albany	+ 11	— 6
" 25.6	Albany	+ 7	+ 5
" 26.6	Albany	— 1	— 7
" 26.6	Cincinnati	— 9	+ 9
" 26.7	Albany	+ 3	+ 3
Oct. 3.6	Albany	+ 5	— 2
" 4.6	Albany	+ 3	+ 3
" 4.6	Albany	+ 6	0
" 4.6	Albany	+ 3	— 2
" 5.5	Albany	+ 1	+ 4
" 7.6	Albany	+ 6	+ 2
" 7.6	Albany	+ 3	— 2
" 9.5	Albany	+ 8	+ 5
" 16.5	Albany	0	— 9
" 17.5	Albany	+ 2	0
" 18.5	Albany	+ 6	+ 1
" 21.5	Albany	— 5	0
" 24.6	Albany	— 4	+ 5
" 25.5	Albany	— 3	— 5

The observations enclosed in brackets were not used as exhibiting large systematic or accidental errors.

A few observations were made with ring-micrometers, but it is not possible to determine how many. At Albany the ring was used until Sept. 21, afterwards the filar micrometer.

The following table shows the constant difference for each observer when there are three or more observations given, and includes nothing later than Sept. 26:—

Observatory.	No. of observations.	$\Delta\alpha \cos\delta$.	$\Delta\delta$.
Albany, B.	8	— 1″	0″
Albany, E.	4	+ 2	+ 3
Cincinnati	4	0	+ 7
Harvard, Wn.	7	+ 18	+ 2
Kiel	7	— 5	+ 4
Leiden	3	— 3	+ 4
Pulkowa	3	+ 4	0
Strasburg	4	— 1	— 3
Wien	3	— 1	+ 1

These constant errors, though founded on rather slender material, probably represent fairly what is to be expected from modern observations of comets.

Following are the heliocentric co-ordinates:—

$$x = r\,(9.580346)\ \sin\,(153^\circ\ 14'\ 15.1'' + v)$$
$$y = r\,(9.996200)\ \sin\,(\ 82\ \ 04\ \ 40.0 + v)$$
$$z = r\,(9.970401)\ \sin\,(174\ \ 59\ \ 17.4 + v)$$

H. V. EGBERT.

Dudley observatory, Albany, N.Y.,
Nov. 6, 1883.

Rapid geological changes in Alaska.

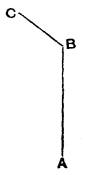
Mr. Dall kindly calls my attention to an error in the note of my remarks, given in SCIENCE of Oct. 19. Hood's Bay is nearly a degree south of the locality of the submerged forest described. Looking at my diary, I find the entry 'Hoona,' which is, I believe, synonymous with 'Bartlett Bay' of some charts. While making my verbal remarks at the academy, I mistook my pencilling of 'Hoona' for 'Hood.' The exact location of the forest is latitude 58° 27′, longitude 135° 40′. I am very much pleased to find from Mr. Dall's letter that my view of the modern changes, drawn from botanical facts chiefly, derives support from some geographical evidence within his reach.

THOMAS MEEHAN.

The mechanism of direction.

I read with interest Professor Newcomb's article on the sense of direction (SCIENCE, Oct. 26). Professor Newcomb says nothing about the behavior of the subjective co-ordinates under a slight change of angle. My experience in this respect I give below, and I have reason to believe the experience to be quite general.

The street A B turns into B C. Walking from A to B, my co-ordinates begin to change when about a hundred yards from B. By the time I get to B, or rather just after B, they have changed by the angle A B C, no matter how large or how small A B C is. The same takes place in going from C to B to A. While close to B on either side, I can by an effort imagine myself under the old co-ordinates; but the new ones are much more natural. In the dark, I think the turn is not seen so far ahead, and the change takes less time. If I go from A to B, with my eyes turned towards A, I have a different experience. I have never tried it by *walking* backwards; but I have observed my sensations while riding on the back platform of a street-car. As the car turns at B towards C, and I am looking towards A, my co-



ordinates begin to change rather suddenly; but there is no sign of a change before B. Shortly after B, I still can conceive myself under the co-ordinates formed on A B, by a mental effort. After about a hundred yards the new co-ordinates have entirely displaced the old.

At the corner of 13th and Spring-Garden streets in Philadelphia I had an experience like that of Professor Newcomb. For a long time I could not approach the place, riding or walking, without my co-ordinates changing by 90°. I cannot account for it. Gradually it wore off, and now no change takes place.

JOSEPH JASTROW.

Johns Hopkins university, Nov. 6.

INTERNATIONAL GEODETIC ASSOCIATION OF EUROPE.

Verhandlungen der vom 11 bis zum 15 September 1882, im Haag vereinigten permanenten commission der europäischen gradmessung. Redigirt von A. HIRSCH und T. VON OPPOLZER zugleich mit dem general bericht für die jahre 1881 und 1882. Berlin, *Reimer*, 1883. 6+155 p., 2 maps. 4°.

THE proceedings of the annual meeting of the committee at The Hague, Sept. 11 to 15, 1882, have just been published. The permanent committee consists of the following members: Lieut.-Gen. Ibañez of Madrid, president; Dr. von Bauernfeind, vice-president; Dr. Hirsch of Neuchâtel, and Dr. von Oppolzer of Vienna, secretaries; Mr. Faye of Paris; and Major-Gen. Baulina of Florence. The delegates, eleven in number, represent most of the countries of Europe. Some invited guests also attended the meeting. The session was opened by the minister of state, Rochusson of Holland, who extended to the members a cordial welcome, which was responded to by President Ibañez.

The last meeting was held at Munich in 1880; but the commission resolved to omit the contemplated meeting for 1881, in order to give its members an opportunity to attend the Geographical congress at Venice: the reports therefore submitted by the several representatives cover the work done, or in active progress, during the two years 1881 and 1882. Secretary Hirsch alludes to the loss sustained by the association since its last conference, in the death of Dr. Carl Bruhns, a member of the commission since 1864; in the death of Gen. de Ricci, one of the veterans of Italian geodesy; of Col. Adan of Belgium, and Professor Stamkart of Holland. The latter had shown that the mean level of the North Sea had not changed during the past hundred and fifty years with respect to the zero of the tide-gauge at Amsterdam. And, last, the association had to mourn the loss of Professor Plantamour of Geneva, whose labors in astronomy and physical geography are so well known, and to whose zeal the recent developments in levels of precision and the progress made in pendulum observations are so largely due.

The Italian commission was increased by Professor Fergola of Naples, by Professor Celoria of Milan, and by Lieut.-Col. de Stefanis of Florence. Austria nominated Capt. von Kalmar and Professor Herr as commissioners; Holland completed its representation by Professor Schols of Delft; and Roumania sent Major Capitancanu. The honorary president and founder of the association, Major-Gen. Dr. Baeyer, who, on account of ill health, was unable to attend, presented a report of the labors of the Geodetic institute of Prussia during 1881–82. He makes mention of the success of the experiments[1] to determine the difference of temperature between the bars of platinum and brass of the Brunner base-apparatus by means of thermo-electricity. The researches for local deflection of the vertical were extended from the Harz to the shores of the Baltic and the North Sea with the result of proving it a region of predominating negative (A.—G.) deflection, varying between 4″ and 7″. A list is presented of seventeen works published by the institute during the interval. Several of these relate to levels of precision; and the pamphlet by Dr. Sadebeck, entitled 'Literature of the practical and theoretical measurement of arcs,' deserves special mention. In a discussion closing the first session, relative to the probable error in the assigned length of the pendulum, it was stated, that, to judge from the accord of the several swings, it might be estimated at about one micron, but that the oscillations of the pendulum support introduced a constant error, seriously influencing the accuracy of the result; the *direct* measure of the motion of the support entering the result being only a fortieth of the correction to pe applied. By this method the accuracy is estimated at .01 mm. The proposition by Cellerier to swing successively on the same stand two pendulums of the same form and construction, but of very unequal weight, promises complete success towards correcting the defect in question; and the experiment is now being carried out. The second session was chiefly occupied with the reading of reports, and with a discussion respecting the value of the prismatic transit instrument. Six of these instruments employed in the Italian survey gave entire satisfaction, especially with regard to perfection of their images. The dis-

[1] Published in *Astronomische nachrichten*, no. 2451.