absolute necessity of considering the disposition of the library in the immediate future. We have practically reached the limit of accommodations in the library room, and the department of exchanges is housed in the Gallery of the Museum of Fossil Plants and Vertebrates, in Schermerhorn Hall of Columbia University, solely by courtesy of the Department of Geology, and it has already exceeded the space which that department can conveniently spare. Radical measures must be adopted in the near future or the library must close its doors.

Following the reports of officers was the election of the honorary members listed below:

Charles Vernon Boys, 66 Victoria St., S. W., London, England.

Emil Fischer, Professor of Chemistry, University of Berlin, Germany.

William Ramsay, Professor of Chemistry, University College, London, England.

James Geikie, Professor of Geology, University of Edinburgh, Scotland.

The Academy also voted to elect the following resident members to be fellows:

Dr. Henry E. Crampton, Dr. J. G. Curtis, Dr. C. A. Herter, Professor Graham Lusk, Professor Charles Lane Poor, Mr. C. A. Post, Dr. E. L. Thorndike, Dr. R. S. Woodworth. "Fellows are limited to one hundred in number, and are chosen from among the resident members in virtue of scientific attainments or services."

Tellers were then appointed, and the officers for the ensuing year were elected by ballot as follows:

President, Robert S. Woodward.
1st Vice-President, Nathaniel L. Britton.
2d Vice-President, J. McKeen Cattell.
Corresponding Secretary, Harold Jacoby.
Recording Secretary, Richard E. Dodge.
Treasurer, Charles F. Cox.
Librarian, Livingston Farrand.
Councilors, Franz Boas, Charles H. Judd, Charles A. Doremus, M. I. Pupin, Frederic S. Lee, L. M. Underwood.
Curators, Harrison G. Dyar, George F. Kunz, Alexis A. Julien, Louis H. Laudy, E. G. Love.
Finance Committee, John H. Hinton, C. A. Post, Cornelius Van Brunt.

Following this routine business President Woodward delivered his annual address, entitled 'Observation and Experiment,' which will shortly be printed in this JOURNAL. After a vote of thanks to the President for his address, proposed by ex-President Henry F. Osborn, the meeting adjourned.

RICHARD E. DODGE,
Recording Secretary.

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*RECENT PROGRESS IN GEODESY.**

So much has been published during the past year in regard to recent events in the world of geodesy that there is apparently little to be said upon this occasion. But a bird's-eye or general view of a subject has its own special interest and value even to those who are familiar with the details.

It is not necessary to review the recent progress in geodesy in foreign countries, since such a review was presented in January before the Society in the form of a report upon the International Geodetic Association Conference of 1900, by Mr. Isaac Winston, the delegate on the part of the United States to that conference, and this report is in print.†

The principal geodetic enterprise now on foot in the United States is the measurement of a great arc along the 98th meridian from the Rio Grande to the Canadian border. Work upon this arc was commenced in 1896. The present state of the undertaking is that the reconnaissance is complete from northern Nebraska to the Rio Grande; that the triangulation, that is, the measurement of the horizontal and vertical angles, is complete from latitude 42½° in northern

* Read before the Philosophical Society of Washington, February 16, 1901.

† See SCIENCE, January 25, 1901, pp. 129–133. A more complete report upon the conference is published in *Revue générale des sciences*, Nov. 15, 1900, pp. 1175–1183; Nov. 30, 1900, pp. 1224–1233.

Nebraska to latitude 38½° in southern Kansas, a distance of about 300 miles along the meridian. Nine bases have been measured along this arc in addition to the Salina Base on the 39th parallel arc, which serves also to control the lengths on a portion of the 98th meridian arc. But four more bases are necessary for this arc, one at the Rio Grande and three in the Dakotas.

During the year 1900 two triangulation parties were in operation, one working northward in Nebraska and the other southward in Kansas. A base party of ten officers and men, which arrived on the working ground on July 16, 1900, in Nebraska, had by January 23, 1901, standardized the base apparatus twice, at the beginning and end of the season, and had measured the nine primary bases referred to above. The probable error of each base is less than one part in a million. If this feat of measuring nine bases as well as standardizing the apparatus in but little more than six months, while holding the accuracy up to the best standards of the past, is considered with reference to the moderate size of the party and the time which has been required for former primary base measurements, it will be seen that there has been no lack of progressiveness along this line.

One of the events of the year has been the connection of the gravity measures in the United States with those in Europe by swinging a set of the half-second pendulums, which serve to determine the relative values of gravity, at the base station at Washington and at the European stations at London, Paris and Potsdam, at which the more important European absolute measures have been made. The result of this expedition is to import, at a very small cost in time and money, the expensive and laborious determinations of the absolute value of gravity which have been made in Europe.

During the last two years the instrument and the methods used in precise leveling of the Coast and Geodetic Survey have been radically changed with a view to increasing both the accuracy and the rapidity of the work.* The evidence as to the accuracy of the new work is rapidly accumulating and so far fully justifies the changes made. The lines of leveling are being rapidly extended, a total of 1750 miles having been run during the last two years.

The most marked progress, however, in the matter of leveling has been the adjustment of the level net covering the eastern half of the United States. More than 13,000 miles of precise leveling had been run by various organizations in the United States. But until within a year the results had not been correlated. To obtain the results it was necessary to search through scores of volumes, and even when this had been done it was found that the results had been published as if each line or group of lines was entirely independent of the others, whereas in fact the connections existed for treating the whole as a single net upon one basis. The adjustment of this net has now been made. The elevations and descriptions of the four thousand permanent bench marks connected with the net, and the principal items of information in regard to each of the lines, have been published in a single volume.†

During the year the report upon the transcontinental triangulation, which marks an epoch in the history of geodesy in the United States, has been published.‡ The computation of the eastern oblique arc, extending from Maine to Louisiana has been

* See Proceedings of the American Society of Civil Engineers, November, 1900, pp. 1113–1161.

† See Appendix 8 of the Coast and Geodetic Survey Report for 1898–99, pp. 347–886.

‡ The Transcontinental Triangulation, Special Publication No 4, of the Coast and Geodetic Survey, Washington, 1900, 4to, 871 pages.

also completed * and the report will soon be ready for the printer. The relations between the measures of the earth made in the United States and the previously accepted values for the earth's size are shown in the table given below.

The last two determinations shown in the table are of light weight in comparison with the preceding three.

A study of these values will show that the modern observations in the United States indicate that the true value of the equatorial radius lies between the Clarke and Bessel values, but nearer the Clarke value, and for the polar semi-axis is a little greater than the Clarke value.

	Equatorial radius, a, in meters.	Polar semi-axis b, in meters.	Compression $(a-b)/a$.
Bessel spheroid of 1841	6,377,397	6,356,079	1/299.2
Clarke spheroid of 1866	6,378,206	6,356,584	1/295.0
Harkness, 1891. From 'The Solar Parallax and Related Constants,' Washington, 1891, p. 138. From a variety of sources...	6,377,972	6,356,727	1/300.2
The spheroid determined by the 39th parallel triangulation and the Lake Survey arc of the meridian	6,377,912	6,356,309	1/295.2
The spheroid determined by the 39th parallel triangulation and Peruvian arc	6,378,027	6,356,819	1/300.7
Eastern oblique arc of the United States	6,378,157	6,357,210	1/304.5
Nantucket and Pamlico-Chesapeake arcs of meridian and Peruvian arc of meridian	6,378,054	6,357,175	1/305.5
Lake Erie arc of parallel and Peruvian arc of meridian	6,379,822	6,357,716	1/288.6

Having in mind the large number of astronomical stations attached to, and the large area covered by, the arcs already utilized in the United States, as indicated above, it is reasonably safe to predict that if the United States is eventually completely covered by triangulation and astronomical stations are liberally supplied everywhere, and the mean figure deduced from these observations alone, regardless of those made in other countries, neither the equatorial radius nor the polar semi-axis so computed will differ from the Clarke values of 1866 by as much as 500 meters, and it is about an even chance that either value will not differ from the corresponding Clarke value by more than 170 meters, this being about the height of the Washington monument. In other words, there is little likelihood that the Clarke spheroid of 1866 now used as the standard in this country differs from the spheroid which will most nearly fit this country alone by more than one part in 12,000, and there is an even chance that it does not differ from it by more than one part in 36,000.

It is reasonably safe to make the same prediction in regard to the earth spheroid, or the spheroid which will most nearly fit all the measures which may hereafter be made in all countries, as has been made above for the spheroid which will most nearly fit the United States.

JOHN FILLMORE HAYFORD.
U. S. COAST AND GEODETIC SURVEY.

* See 'Recent Contributions to our Knowledge of the Earth's Shape and Size by the United States Coast and Geodetic Survey.' C. A. Schott, *The National Geographic Magazine*, January, 1901, pp. 39-41.

THE SAN JOSE SCALE IN JAPAN.

THE insidious invasion of the eastern United States by the San Jose scale (*Aspidiotus perniciosus*)—the name gives undeserved notoriety to the California city—has come to be so formidable that the pest is now recognized as one of the most seriously threatening dangers to American