rate of consumption we have standing timber for only about twenty years, and in this connection it is well to add, just as in the case of the man floating in the open boat, that there is no other supply from which we can expect to meet our demands. The Canadians are coming to need all the wood they have; so with the Mexicans. South America is a wonderfully rich continent in forests, but to import timber from that country means that it would be at an expense vastly greater than that of timber grown at home.

We have permitted ourselves to get into a condition where a timber famine is not only likely, but certain, and where the best we can expect to do is to mitigate the famine somewhat, but how much we can mitigate it I do not yet know. How much the use of reinforced concrete and the use of steel and the employment of other construction will help cannot be said, but that these will help to a great extent there can be no doubt. The curious fact remains that there never has been a large substitute for wood, and it is a peculiar fact with the employment of these other methods of construction that there is vastly more wood used for construction in the United States to-day than when

all the construction was of wood; in other words, we are in a place where we must suffer, and in this case we must pay the bill.

Fortunately, it is not altogether too late, because the forest is a renewable resource, and so we have a chance to correct the faults of the past. That we are trying to do. We have about 165,000,000 of acres of national forests established in the West, and shall have others in the East, and naturally these forests will be brought to the point where they will produce the most timber possible from their physical situation, but we cannot expect to meet from one-fifth of the forests of the United States a demand which is exceeding five-fifths, and which is consuming that five-fifths three times faster than it is being produced. In other words, there is distinctly trouble ahead. I said a little while ago that a change in public sentiment was the essential and indispensable factor in this movement of conservation. It is nowhere truer than in the case of the forests. Four-fifths of the forests are in private hands, and unless the owners of these four-fifths will join in the movement to minimize the timber famine, use their forests rightly, we shall have

vastly more trouble than we shall have if they help.

It is certainly true that as our forests are destroyed at the headwaters of our streams, our water powers suffer, the navigability of our streams suffers, irrigation suffers, and the domestic and manufacturing water supply suffers. Wherever our streams flow, and they flow from wherever the stream rises in the mountains or in the forests, and they do so pretty much all over the country, there forest preservation is just as important because of the streams as it is because of the other services which the forest renders.

We have been equally shortsighted in allowing great monopolies to be formed for the use of water power from these streams without the possibility of government control. The idea is growing that it is a fair thing which should win, that the interest of the people at large is greater than the interest of any single man or single body of men less than all the people, and that when Uncle Sam gives us his natural resources it is no more than fair that he should acquire the use of them in a way to do as much good on the one side and as little harm on the other as possible

THE LATEST WORK ON THE SOLAR PARALLAX.

PROGRESS MADE IN A COLOSSAL TASK.

BY ABBE MOREUX.

THE colossal task undertaken in 1900 by nearly all the great observatories of the world under the direction of M. Loewy and the French Academy of Sciences is making rapid progress. The object of this article is to give the latest results of the calculations and to show the degree of confidence which they deserve.

An idea of the uncertainty in regard to the value of the solar parallax that prevailed before 1900 may be obtained from a comparison of the following extracts from the Nautical Almanac:

Date.	Authority and Method.	Solar Parallax, in Seconds.	Distance of Sun.	
			Kilometers.	Miles.
1801-1833	Encke, transits of Venus.....	8.5776	147,100,000	91,410,000
1834-1869	Le Verrier, inequalities of lunar parallax.....	8.805	153,400,000	95,320,000
1870-1881	Newcomb, general mean.....	8.848	147,950,000	91,930,000
1882-1900			148,820,000	92,475,000

The last value 8.848 sec. was derived by Newcomb from a very laborious discussion of all the methods employed up to that time, and represents the most probable mean of the following values:

	Sec.
Newcomb: Observations of Mars in 1862.....	8.855
Hall: Observations of Mars in 1862.....	8.842
Hansen, Stone, and Newcomb: Inequalities of lunar parallax	8.838
Newcomb: Lunar equation of the earth.....	8.809
Powalky: Transit of Venus in 1869.....	8.832
Struve's value of the constant of aberration combined with Foucault's value of the velocity of light	8.860
Most probable value of solar parallax.....	8.848

It might well have been expected that this value would be final but it proved to be nothing of the sort. The uncertainty which prevailed in regard to the solar parallax led the directors of the four great nautical almanacs—French, British, German, and American—to meet in Paris in 1896 for the purpose of adopting a uniform series of astronomical constants, beginning with January 1, 1901. This international conference had at its disposal the following additional values of the solar parallax:

	Sec.
Gill's heliometric measurements of asteroids....	8.802
Aberration of light.....	8.799
Inequalities of lunar parallax	8.794
Mass of the earth deduced from secular variations of the four inferior planets.....	8.759
Mass of the earth deduced from the motions of Venus alone	8.762

As Gill's measurements were by far the most certain of all and as his value differed very little from the values obtained from the parallactic inequalities of the moon and the aberration of light, the value 8.80 sec. was adopted for the solar parallax, and this value was inserted in the almanacs for the first years of the twentieth century.

This decision had hardly been reached when serious opposition began to manifest itself in various quar-

ters. Even before the almanac for 1901 had come into use one of the leading advocates of the adoption of the value 8.80 sec. proposed the following very different series of values:

	Sec.
Gill's measurements of asteroids.....	8.802
Aberration of light	8.77
Inequalities of lunar parallax	8.77
Mass of the earth derived from secular variations	8.759

Here the probabilities are 3 to 1 in favor of a value of 8.77 sec. or less, while in the preceding table the probabilities were 3 to 2 in favor of a value of about 8.80 sec. Indeed, it was generally suspected, after 1898, that the adopted value, 8.80 sec., was too large.

At this juncture came the memorable discovery of Eros, and as this asteroid would be very near the earth in the winter of 1900-1 it was agreed to make use of this favorable opposition for the solution of the problem. From 67 measurements of photographs taken at Northfield observatory, Wilson concluded that the solar parallax was very nearly 8.80 sec. Hinks, of Cambridge, obtained from 295 photographs taken at nine observatories a value of 8.797 ± 0.0047 sec., which in the case of a positive error would give 8.8017 sec., a value which differs very little from the value adopted in the nautical almanacs. Since this announcement was made the discussion of the photographs of Eros taken at Greenwich has been completed. The resultant provisional value of the solar parallax, as communicated to the Royal Astronomical Society, is 8.800 ± 0.0044 sec. This value was obtained from measurements of 151 plates made with the astrophotographic telescope of 13 inches aperture and 103 plates made with the Thompson 26-inch telescope, between October 14, 1900, and January 15, 1901. These three values derived from Eros agree very closely with each other and also with the mean of all values obtained since 1825, as computed by Dr. Weinberg: 8.804 ± 0.00243 sec., and with Sir David Gill's value: 8.802 ± 0.005 sec.

It appears, therefore, that the value 8.80 sec. is not as erroneous as has been supposed. What, then, is the explanation of the discrepancies and differences of opinion?

Direct astronomical methods have always given higher values than those obtained by indirect methods. The whole question hinges on the degree of confidence to be accorded to the different methods. It is evident, *a priori*, that the solution of the problem should be sought by direct astronomical mensuration. If the values thus obtained do not agree with the results of indirect methods the burden of proof rests on the advocates of the latter.

For example, the value of the solar parallax deduced from the aberration of light increases by 0.44 sec. for each decrease of 1 sec. in the value of the constant of aberration. The accepted value of this constant is 20.54 sec., and the corresponding value of the solar parallax is 8.773 sec. If the parallax has been proven, by direct methods, to be 8.80 sec., the obvious inference is that the current theory of aberration is false and that the phenomenon is more complex than has been assumed. Similarly, to quote Prof. Hinks, if new researches confirm the conclusion that 8.76 sec.

is the only value of the solar parallax that can reconcile the current theory of planetary motions with the observed value of the constant of gravitation, the contradiction between the direct and indirect methods may lead to the discovery of the defects in that theory, which now make impossible a complete explanation of the movements of the solar system.

In these circumstances the best course will be to endeavor to perfect the various methods, in order to eliminate all sources of error and make the results strictly comparable. The complete discussion of all the data furnished by the observations of Eros in 1890-1 will give a value of the solar parallax affected with a probable error not exceeding one-thousandth of a second. But this is not enough, and Sir David Gill has already appeared with a demand for still greater precision.

In 1931 Eros will approach the earth within 16,000,000 miles, about half the distance that separated the two planets in 1900, and Gill asserts that it will then be possible to determine the solar parallax to one ten-thousandth of a second. He adds that preparation for this great astronomical event should begin at once. The cause of the systematic errors affecting some of the photographs should be discovered, special photographic reflecting and refracting telescopes constructed, and the stars near the path of Eros in 1931 accurately charted with the aid of these instruments. The comparison of the positions of these stars, as obtained with different instruments, will enable the true position of Eros, without systematic error, to be found, if all the instruments agree, and will reveal the sources of error if they do not agree. As Eros will describe a very long path during the opposition of 1931 it will be desirable to begin at once the meridian observations required to fix the positions of the reference stars to be used in the measurement of photographs.

The magnitude of this undertaking makes it necessary to distribute the work among all the meridian observations of the world. For this reason Sir David Gill proposed, last August, that a congress of astronomers be convened without delay for the purpose of considering the work to be done in preparation for the opposition of Eros in 1931. If the hope of this eminent astronomer is fulfilled we shall know the sun's distance to within 10,000 miles—little more than the diameter of the earth.—Translated for the SCIENTIFIC AMERICAN SUPPLEMENT from Cosmos.

Gold-Purple Ink.—*a.* Sodio-chloride of gold 1 part, water 10 parts, gum 1 part. *b.* Tin salts 1 part, water 100 parts, gum 10 parts. *a* for writing, *b* for preparing textiles. *a.* Gold is dissolved in strong hydrochloric acid, to which, from time to time, some nitric acid is added, until all is dissolved; to 4 parts of hydrochloric acid about 1 part of nitric acid is required. Concentrate it by evaporation, dilute it with water and while warm add a solution of oxalic acid, which causes the precipitation of the gold in the form of a fine brown powder. The pure gold, after being washed out, is again dissolved in a mixture of hydrochloric and nitric acids, and the solution mixed with common salt. On concentration by evaporation, we obtain crystals of sodio-chloride of gold.