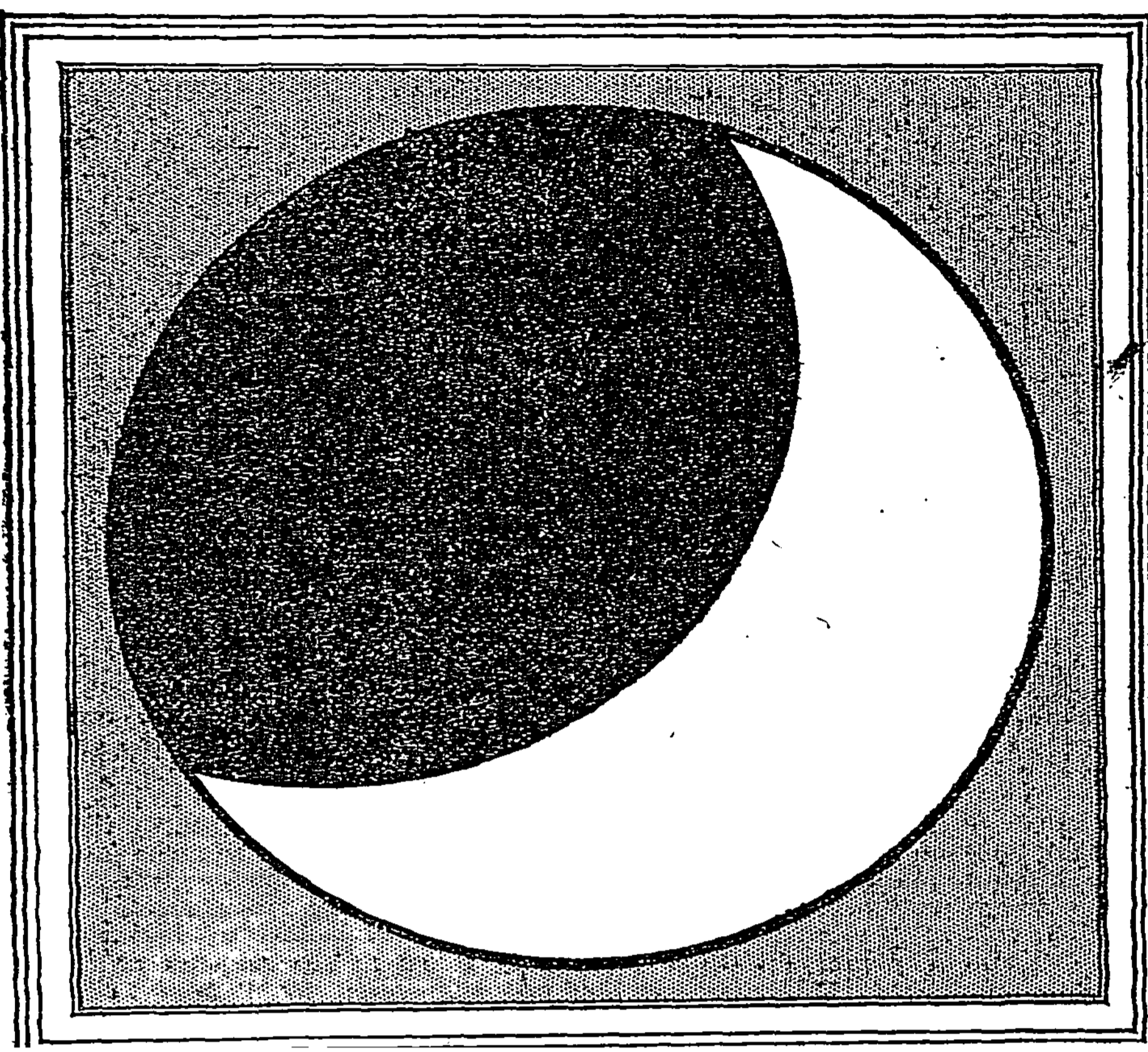
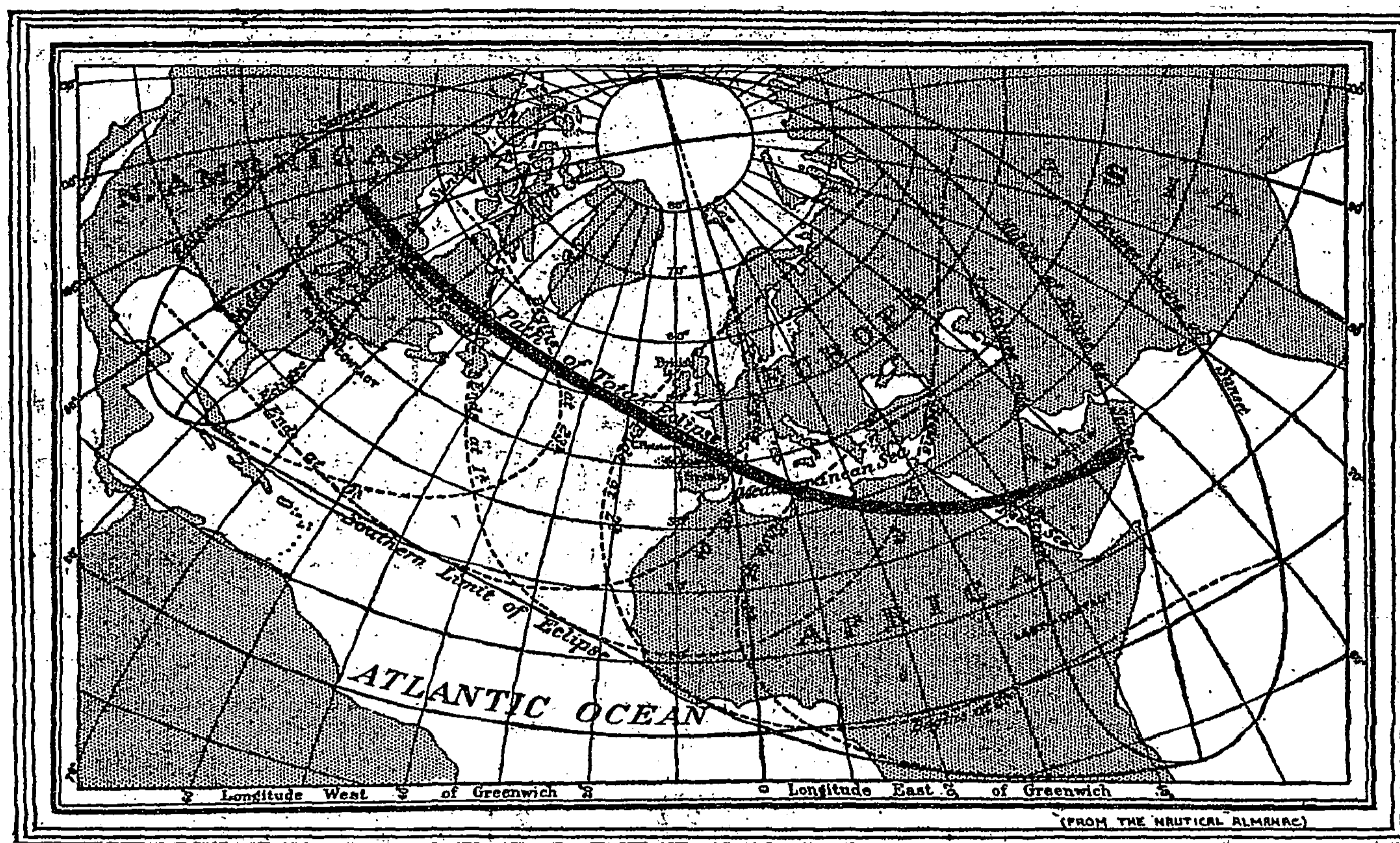


# Professor Young On the Solar Eclipse

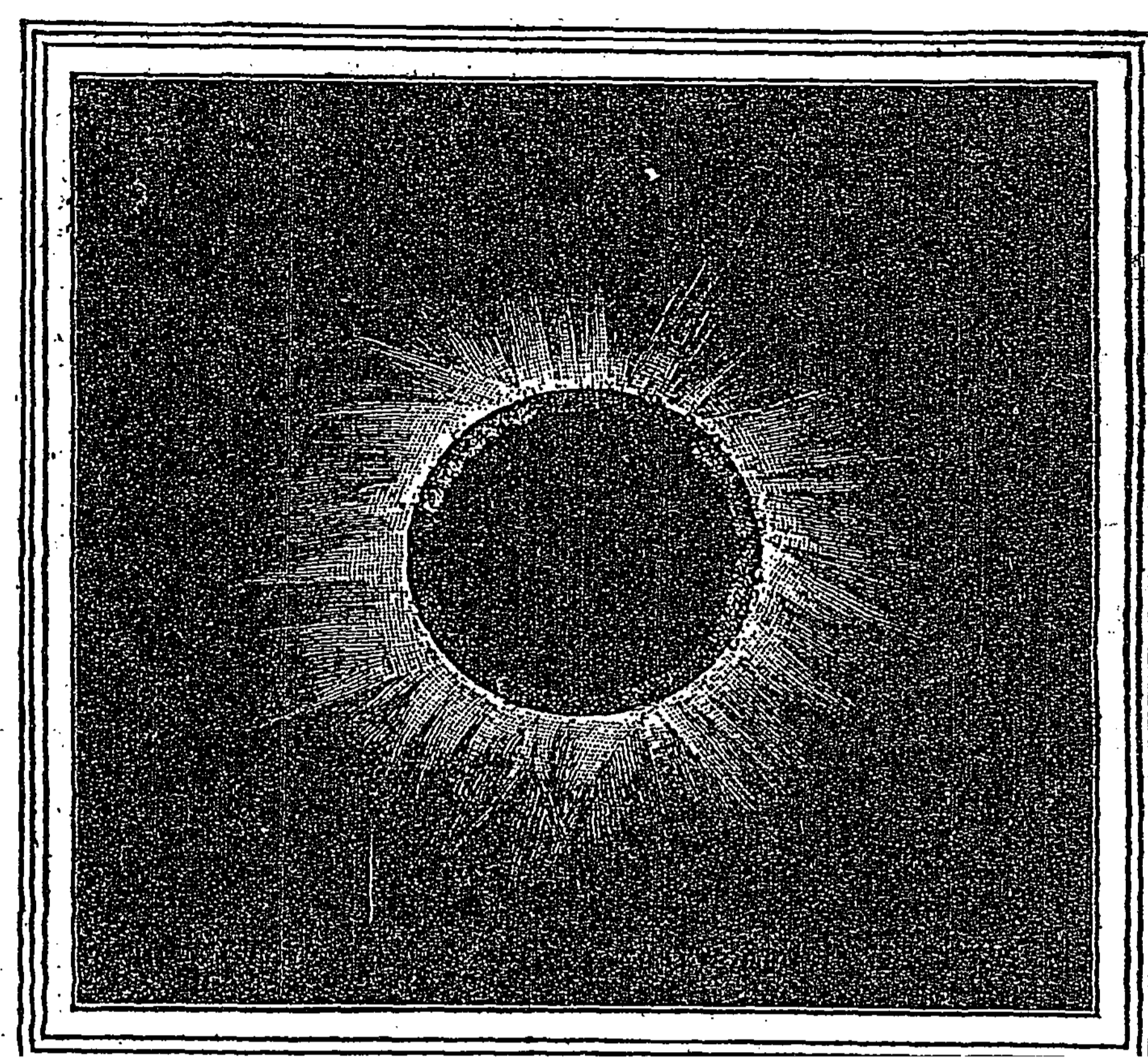
Princeton's Eminent Authority On the Sun Tells What Astronomers Hope to Learn Through Their Observations Next Wednesday.



HOW THE ECLIPSE WILL LOOK IN NEW YORK AT 6:30 A.M.



PATH OF TOTAL ECLIPSE OF AUGUST 29-30, 1905.



PHOTOGRAPH OF A TOTAL ECLIPSE SHOWING THE CORONA.

**"If the Glory Is Short-Lived It Is, While It Lasts, the Most Impressive and Beautiful of All Celestial Phenomena--Well Worth Long Travel Merely to Gaze At as a Spectacle, and Never to be Forgotten"--How the Eclipse Will Appear to New Yorkers.**

ON the morning of the 30th--Wednesday next--the shadow of the moon, like an immense black cloud 150 miles in diameter, will strike the earth at sunrise a short distance northeast of the City of Winnipeg. From this starting point it will travel swiftly across the southern extremity of Hudson Bay and the uninhabited wilderness to the east of it until it reaches the coast of Labrador a little south of Hamilton Inlet--a distance of 1,700 miles swept over in less than three-quarters of an hour. Leaving the American coast the shadow crosses the Atlantic in a southeasterly direction until it strikes the Biscayan coast of Spain, travels obliquely down across the peninsula, passing over the cities of Oviedo, Leon, and Burgos, entering the Mediterranean at about the 40th parallel of latitude, and leaving Valencia just outside the southern limit of its track. In crossing the Mediterranean it passes over the Columbretes group and some of the Balearic islands, enters Algiers at Philippeville, leaves it again at Sfax, and then for a long distance grazes along the coast of Tunis and Tripoli to the eastern coast of the Bay of Sidra--the Syrtis Major of the ancients.

It is worth noting that along this African coast the track of the shadow almost coincides with that of the eclipse of May, 1900, though elsewhere most of the course of the latter eclipse lay considerably further south. It is rather seldom that a region enjoys two solar eclipses within five years. It is nearly two hundred years since one has been visible at London, and the last one seen in New York was in 1806.

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At the Bay of Sidra the shadow enters the Libyan Desert, over which it travels to Egypt, and crosses the Nile near Assouan about an hour and a half before sunset. It hurries across the Red Sea, sweeps over the holy city of Mecca, and finally leaves the earth near the southeastern corner of Arabia.

From the point of beginning to the terminus the great circle distance is nearly 7,400 miles, traversed by the shadow in a little less than three hours of Greenwich time at an average speed of nearly 2,500 miles an hour. For the most part, however, the velocity is much lower, except near the beginning and end of the shadow track, where, near sunrise and sunset, the shadow falls very obliquely on the earth's surface, and moves with extreme swiftness.

The width of the track varies somewhat in its different portions, but is nowhere much less than 150 miles, in Spain and Algiers reaching nearly 200, which is considerably above the average for solar eclipses.

The duration of the "totality" (the time during which the sun is wholly covered by the moon) is everywhere short, ranging from about 2½ minutes in Canada and Arabia to 3½ in Spain. It is always a short-lived glory--that of total eclipse--by no possibility reaching as high as seven minutes. The eclipse of 1901 in Sumatra and Borneo, with its duration of six minutes, holds the record among all that have ever been actually observed.

But if the glory is short-lived it is, while it lasts, the most impressive and beautiful of all celestial phenomena--well worth long travel merely to gaze at as a spectacle, and never to be forgotten. No mere description or pictorial representation can do it justice.

To the astronomer it is a golden opportunity, to be made the most of for important researches, which are possible only during those fleeting seconds when the sunshine-flooded air is darkened, so that we are able to see through it the wonderful and lovely things which at other times are hidden from us by its veiling brightness.

For the sun as we ordinarily see it is but the dazzling nucleus, the mere kernel, of the immensely larger whole. The central globe is clothed with an enveloping atmosphere, thousands of miles in depth, in some respects resembling our own, but in more entirely different in nature and function. And from this atmosphere reach out for millions of miles filaments, rays, and streamers of unknown and mysterious origin and constitution, which make up what we call the "corona." It is in the study of this magnificent vestment, these royal robes of the ruler of our material universe, that we reasonably

hope to find the explanation of many mysteries in the nature and constitution of the sun itself, and not only so, but also of many curious phenomena encountered on the earth. In the "corona" we have to do with matter under conditions which can be but feebly approximated here, and seem to offer opportunity for a far-reaching extension of our knowledge.

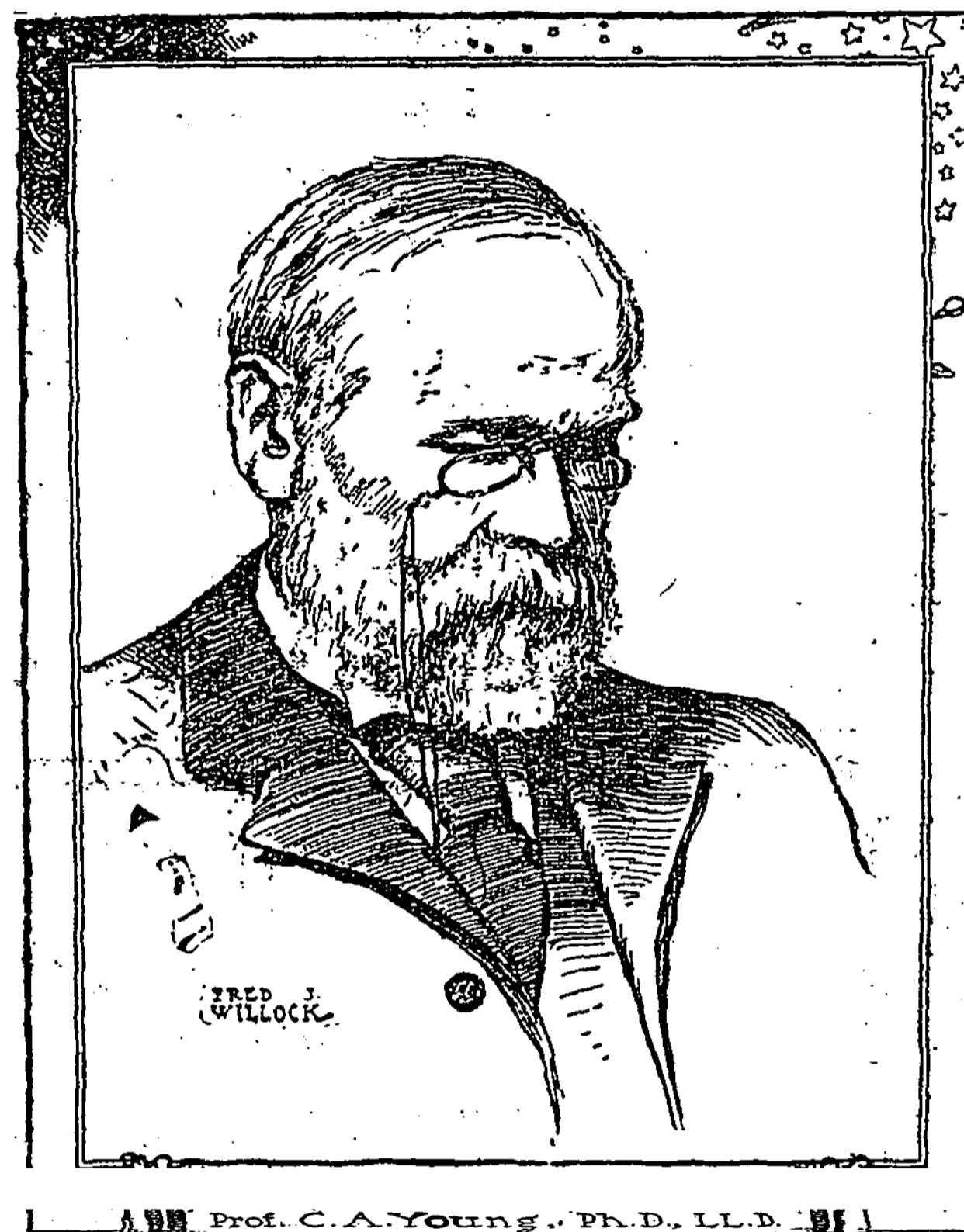
Naturally, therefore, the study of the solar atmosphere and the corona forms the main object of most of our eclipse observations. They include the investigation by eye, and still more by photograph, of the spectrum of the different parts of the corona; of the changes in form and detail, during the passage of the shadow across the earth, by means of photographs made all along the track of the relations of the coronal features to those which underlie them, such as the sun spots and faculae, and the so-called prominence, the great flame-like structures of hydrogen, helium and calcium vapor, which glow during the totality like rubies studding the outline of the obscuring moon; the polarization of the light from different portions of the corona is also to be studied, as helping us to discriminate between the gaseous and non-gaseous elements of its constitution, and radio-metric observations of the heat it sends us must be made. The so-called "flash spectrum" of the lowest strata of the solar atmosphere, observable for a few seconds at the beginning and end of the totality, (first seen in 1870, but not photographed until 1896,) comes in for special attention because of its important bearings on the nature of the photo-sphere and the source of solar heat. Nor can the prominences be entirely neglected.

There are also other matters to be investigated not directly related to the sun: such, for instance, as the question of planets nearer the sun than Mercury is, too small ever to be detected by eye or photograph under ordinary circumstances, but possibly recognizable on photographs made during the eclipse with instruments specially designed for the purpose. And still another problem relates to the exact limits of the shadow track, the determination of points where the totality is only momentary; these observations, especially at stations where the eclipse occurs near sunrise or sunset, furnish data for correcting our knowledge of the precise positions of the moon and of the observer with respect to the centre of the earth, and so contribute to an exact determination of the earth's dimensions and figure.

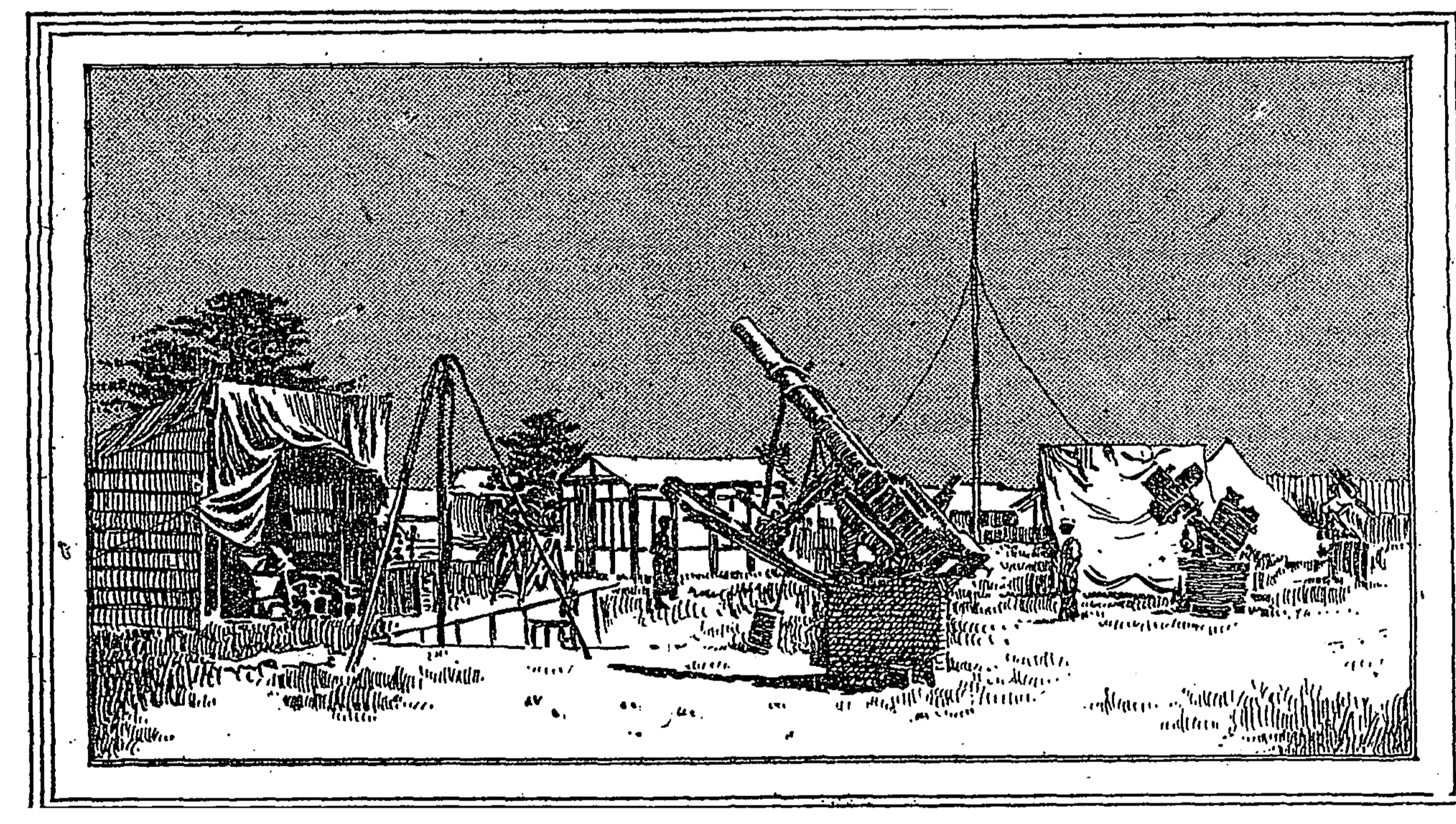
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Obviously all these investigations, excepting the last, require special apparatus of extreme delicacy and refinement in the hands of experienced and skillful observers. Astronomers all over the world are, and have been for months, making elaborate preparations, and numerous expeditions have been sent with more or less extensive equipments to occupy stations all along the path of the eclipse. Germany and France send the greatest number, and naturally they will mainly confine their operations to Spain and Northern Africa. England, Spain, and Italy are also well represented. Four large English parties are in the field; one is near Oropesa, on the eastern coast of Spain, very near the centre of the track, under the charge of Prof. Fowler. The second, most magnificently equipped, is headed by the veteran, Sir Norman Lockyer, and was to have been stationed at Philippeville, just where the central line enters Algiers. But on their arrival the French authorities, for military reasons, the place being strongly fortified, would not permit the British naval vessel which brought them to remain in the harbor, and the party has probably been forced to change its plans and seek some different station; presumably not far away. The third party, directed by the Astronomer Royal, Sir William Christie, is at Sfax, and the fourth, under Prof. Turner of Oxford, is in Egypt, near Assouan. Several other stations will be occupied by English amateurs, either singly or in small parties of two or three.

There will also be at least five parties from the United States in the same region, three from the Naval Observatory at Washington and two from the Lick Observatory in California; there may be a sixth from the Indiana State University at a Spanish station, but the writer has seen only indefinite statements in respect to this. The parties



Prof. C. A. Young, Ph.D., LL.D.



A typical outfit of apparatus for observing and photographing the solar eclipse.

from the Naval Observatory sailed several weeks ago under the general direction of Admiral Chester (the Superintendent of the observatory) in the naval vessels Columbia and Caesar, detailed for the purpose. The parties include, in addition to the seven members of the observatory staff, several representatives from the Weather Bureau, the Smithsonian Institution, Johns Hopkins and Columbia Universities, and Dartmouth College. It was the intention to station one of the parties on the Spanish coast of the Mediterranean north of Valencia, another on one of the Columbretes islands and the third somewhere on the railway between the cities of Algiers and Tunis, but the precise locations were left to be determined after the arrival of the expedition, and may have been slightly altered on studying the local conditions. Doubtless the parties have long since been duly placed, with sufficient time to erect and adjust their extensive instrumental equipment.

Of the three important parties which compose the "Crocker Eclipse Expedition" of the Lick Observatory one will go to Labrador, one to the eastern coast of Spain, and one to Egypt where the shadow crosses the Nile. Prof. Campbell, the Director of the Lick Observatory and head of the expedition, is expected to be in charge at this station. They are all well fitted out, with special reference to the search for intramercurial planets, but hardly less perfectly for the other lines of work. Several American institutions have an interest in the expedition through instruments and apparatus loaned as part of their equipment.

In Labrador, where the eclipse occurs rather too early in the morning, and under rather doubtful weather conditions, the ground will be occupied entirely by American parties. The largest one is that sent out by the co-operation of the Canadian Government and the University of Toronto. It will have its principal station at the head of Lake Melville, a little beyond the extremity of Hamilton Inlet, and more than a hundred miles from the coast, on which account they hope for better weather than is probable nearer the sea. Two or three substations will also probably be occupied. The large party from the Lick Observatory, under the charge of Dr. Curtiss, will observe at a station in Sandwich Bay, and a party from the University of Illinois will probably occupy a station not very far away. There are several excursion parties going to the Labrador waters this summer, and it is quite likely they may carry some amateurs, who, if the weather is favorable, may be lured to observe and photograph the eclipse. It is understood, too, that similar excursions are going to the Spanish waters from France and England, and of course the passengers on some of the Atlantic steamers will some of them doubtless find themselves in the eclipse track and have a fine view of the spectacle, though without the ability to make observations of any real value.

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Altogether it seems probable the number of skilled observers of this eclipse, and the efficiency of their instrumental outfit, exceeds anything which has hitherto ever entered the field on such an occasion, as of course ought to be the case, since each observed eclipse adds astronomical experience, suggests new problems and new means of investigation, and adds new interest. Let us hope that the skies may

to those who are outside it. For nearly a thousand miles on each side of the central line the moon partially obscures the sun, nearly covering the sun for observers not very far away from the track, and merely taking a little "bite" from the solar disk for those who are more remote. And accurate observations of the exact instant when the moon first impinges upon the edge of the sun, and when it leaves it (the first and last "contacts," as they are technically called,) are of substantial astronomical value in testing the accuracy of our lunar tables and furnishing data for their correction.

To a non-astronomical observer it is very interesting, if only through a smoked glass, to watch the progress of the moon across the sun, from its first contact on the northwest "limb" (edge) of the sun until it leaves it an hour and a half later. If he has access to even a small telescope it is still more interesting. At New York the eclipse occurs rather too early to suit the convenience of most people. According to the computation of the writer the first contact takes place at 5 hours 38 minutes Eastern standard time, which is only about twenty minutes after sunrise. The obscuration will be greatest at about 6:30, when a little more than two-thirds of the sun's diameter will be covered and about 60 per cent. of its surface hidden, so that it will look as shown in the figure. But, although so much of the sunlight is cut off, the effect will hardly be noticed by any one not watching for it. Further south the encroachment of the moon on the sun will be less and less, as the distance of the observer from the central line increases; the southern limit passes through Porto Rico and Haiti. But south of Washington, along the coast, the eclipse begins before sunrise, and very little of it will be visible.

*C. A. Young*

Hanover, N. H., Aug. 21, 1905.

## A FUTILE EFFORT AT REFORM

MISS JULIA RICHMAN, Assistant Superintendent of New York schools, is working heart and soul to Americanize the immigrant child. To further the cause she has taken up her residence in the heart of the congested east side, and in the schools and out of them is ever on the alert to save the little foreigner from the evils that beset his path. Long ago she began on his behalf a continuous performance of personally reading every juvenile game of craps that came within reach of her eye. Her official duties have made her figure familiar to the schoolboys in her district. Consequently, when the youthful gamblers see her walk unheralded into their midst and silently put forth a gloved hand, stern as fate, there is an immediate and unconditional surrender of the full heap of grimy coins repose upon a certain shelf in her office. Recently, however, one daring little immigrant reversed the order of things. Here is the tale in Miss Richman's own words:

"I was on my way home after a protracted session with the child labor law. On the opposite corner I held the unmistakable symptoms of a game of craps. There stood the usual outer group of boys, watching an inner group sprawled upon the sidewalk in the shadow of a friendly pushcart. I crossed over and, without a word, held out my hand. The outer group instantly melted away. The inner group shamefacedly handed over the spoils. This is, all but one boy. This one, gathering to himself a dime that still lay upon the flagging, rose to his feet and stolidly dropped a moist copper into my hand.

"I fixed on him a look that in thirty years had never failed to quell the most unruly youngster. Then I said quietly: 'The dime also!' The young culprit, Russian born and Russian bred, was evidently bewildered. What? Did not a fair share of the money suffice the Government representative? Must one then give up all of it here in America, in free America?

"Suddenly his face changed, and with lightning swiftness he bent, swept into his own hand all the coins that lay in mine, and--was gone!

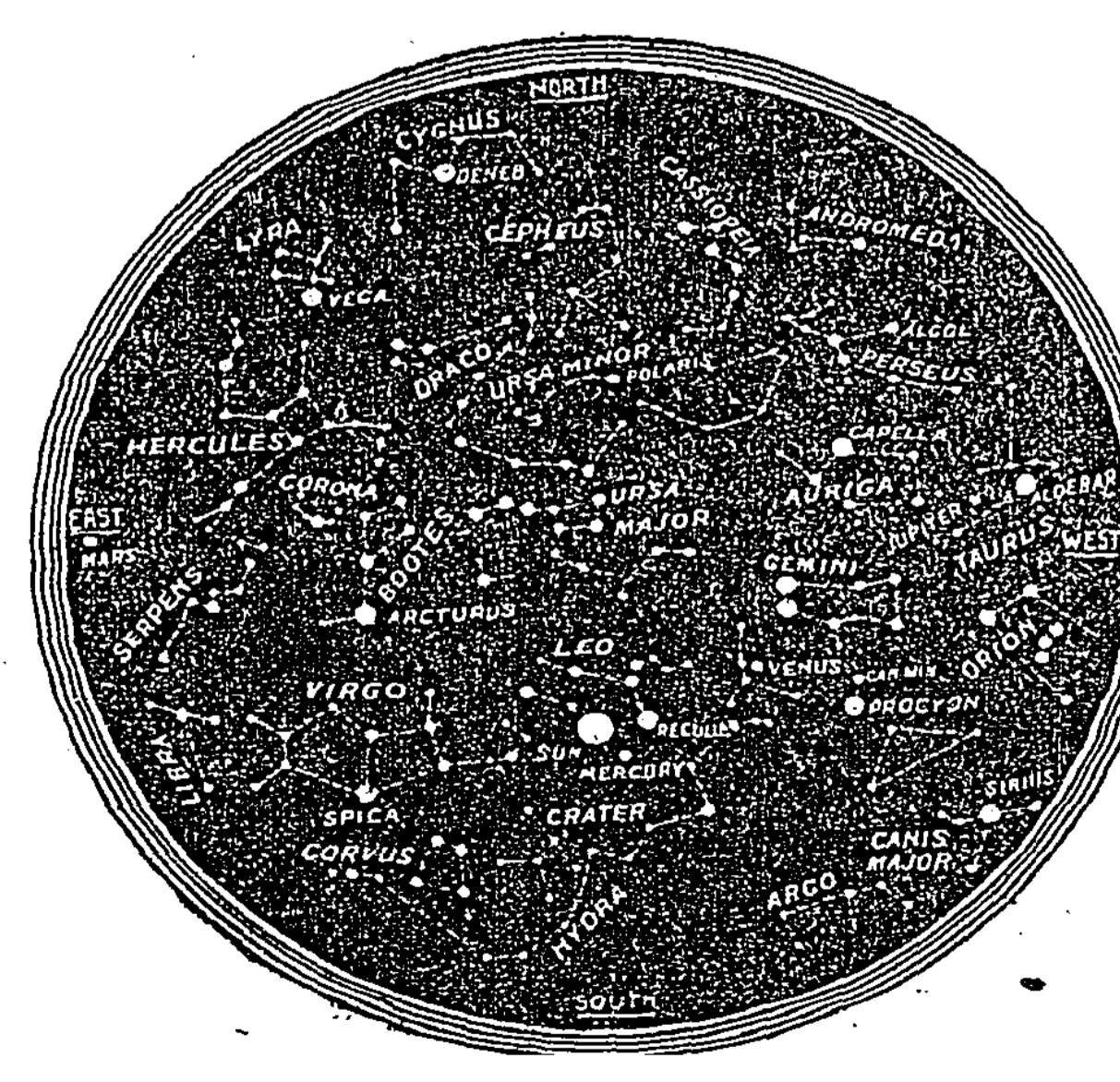
"I wish some one had caught the scene with a snapshot. I should like to know who looked more dumfounded--the District Superintendent, who had been worsted, or the boys who, breathless, had witnessed the working."

## CHOCOLATE, COCOA, COCA.

CHOCOLATE is made by grinding the roasted kernels of the seeds of the Theobroma cacao, a tree indigenous to Mexico, to which paste sugar and flavoring are often added. Cocoa, or more correctly cacao, is made in a similar manner, but the cocoa butter is more or less removed, which renders it more digestible. Cocoa is the leaf of an Andean shrub of the Erythroxylon species. There is not even a distant relationship between cocoa and cacao.

The word coca is derived from the Quichua word ku-ka, meaning the shrub or plant par excellence, from the fact that coca was employed so intimately by the Incas that they termed it "divine plant." The word was corrupted by the Spanish invaders to coca.

The Andean Indians will not work unless supplied with a daily ration of coca. It is given them in place of other food or drink to carry with them during their toil. Cocaine is derived from coca.



POSITION OF THE SUN ON THE DAY OF ITS ECLIPSE.

be favorable (for astronomers are helpless under clouds) and that results may be obtained commensurate with the expenditure of thought, labor, and money.

While the chief interest of an eclipse lies along the track of the shadow it is not wholly uninteresting