

# COLORADO COLLEGE MAY HAVE NEW OBSERVATORY

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## The Authorities Are Planning to Establish Station on Knob Hill and Equip It With Powerful Telescope.

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The authorities of Colorado college are considering establishing a new observatory. The building, which, according to tentative plans, will be the most complete for the purpose in the west, will be erected on high ground in the vicinity of the city, possibly on Knob hill. It will possess a telescope of large power.

The proposition, it was announced yesterday by members of the faculty, has not advanced to that stage where definite plans can be announced. The matter is being favorably considered, however, as the need of just such a feature of Colorado college is very apparent. The present observatory is a stone building, two stories in height, in a declivity near Washburn field. It has a telescope of fair power but is inadequate in view of the importance that would attach to a well-equipped observatory at this altitude. The college, as has been fully announced in

the Gazette, is branching out in regard to the weather bureau which, through the donation of General Palmer, will be made one of the most efficient in the country. The observatory plan is in line with the betterments assured in the meteorological bureau. It is believed that if the plans of the faculty bear fruit the new observatory will be regarded as one of great importance.

It is the opinion at the college among astronomers that the belief at Cambridge, Mass., among the Harvard faculty that atmosphere has been found to exist on Mars is correct. Professor Percival Lowell, of the Lowell observatory at Flagstaff, Arizona, has reported that a brilliant projection has been discovered on the planet Mars. The general belief in Cambridge is that Professor Lowell saw a cloud and if this is true it would indicate an atmosphere which in turn would make it possible for Mars to be inhabited.

# PHOTOGRAPHING THE STARS WITH TELESCOPE AND CAM- ERA OUT ON NOB HILL

To a professor of Colorado college, Prof. Frank H. Loud, belongs the honor of doing the first regular and definite work in stellar photography, in Colorado.

For about two months he has been engaged in the work at Nob Hill. This place was selected because there was freedom from dust and haze which often overhangs the city, and also because the reflection from the electric lights would be minimized.

For over a year Professor Loud has been endeavoring to secure a telescopic-photographic instrument for work out here. He believed that better results could be obtained in Colorado than in many other sections of the United States. He finally secured an instrument from Harvard university which is similar to two others which the university owns at Cambridge and Arequipa, Peru.

## Clear Atmosphere.

The clear atmosphere of Arequipa has enabled the observers at that point to do some very complete work in photographing the southern skies. This work is much more complete than anything which has been accomplished in the north, and for this reason Harvard university has been willing to loan the instrument which is now in use at Nob Hill.

This machine is ingenious and somewhat complicated. The telescope is placed

upon an eight-inch pipe, which is five feet under ground and five feet above ground. In order to make the base thoroughly firm and steady, the pipe in which the instrument stands is surrounded by a bed of concrete two feet thick. Attached to the telescope is the camera. This camera has been pointed at the polar star in the exposures thus far made and by a clockwork control communicated electrically from the house to the instrument the lens of the camera moves in consonance with the movement of the earth in order that the same star or group of stars may always be impressed upon the plate. This clockwork system is absolutely necessary owing to the fact that the exposures in this work last from one to four hours.

## Only a Beginning.

The work which has been done thus far is largely preparatory and has been with a view to getting the instrument adjusted properly for its work. Hence most of the exposures thus far made have included the polar star because of the special adaptability of that region of the sky for the purpose. The arc of the heavens which is taken in the various exposures is about 15 by 12 degrees, or large enough to include, say, the Little Dipper.

It is, of course, quite too early to say just what results may be obtained from this work. But the 15 plates already made give ground for the belief that valuable

data may be obtained for use in astronomical work. The work here will be largely confined to the northern heavens in the effort to secure as complete facts regarding them as has been done with the southern skies.

## A Good Location.

Harvard university was unable to do this on account of its location. It is necessary in this work to expose the plates for several hours in order that the fainter stars may be imaged upon the plates. But in Cambridge after a certain time the reflection from the electric lights caused the plates to become fogged and hence spoiled the work.

The plates are themselves of deepest interest. One can see little upon them with the naked eye, at least only the larger stars, but by the use of a magnifying glass the many smaller and fainter stars are disclosed, making a very interesting study for scientist and astronomer. The location at Nob Hill is in many respects an ideal one. It is elevated, quiet, free from smoke and the glare of electric lights and gives that intense blackness which is desirable in stellar photography.

Professor Loud is to be congratulated upon this opportunity of doing a work at once so interesting and valuable in the scientific world.

Prof. Loud will give the results of his investigations in an article in the Frontier Monthly to be issued this week.

use of full western regalia.

will The second act is at the dinner party  
and is full of excitement. The visitors

## STELLAR PHOTOGRAPHY

Subject of Lecture at Y. M. C. A. Jan-  
uary 19, by Professor F. C. Jordan  
of the High School.

"Stellar Photography" is the subject  
for the next practical talk to be given  
at the Young Men's Christian associa-  
tion. The lecture will be given by Prof.  
F. C. Jordan of the High school, Janu-  
ary 19, in the auditorium of the asso-  
ciation building, and it promises to be  
one of the star attractions of the course.

Professor Jordan will outline the de-  
velopment of the photographic science  
and tell of the instruments used in  
modern photography. He will discuss  
the use of the camera in studying as-  
tronomy and of the work being done  
at Nob Hill in connection with the Har-  
vard observatory station. The lecture  
will be illustrated by several new lan-  
tern slides which Professor Jordan has  
recently received from the east.

## NEW OFFICERS



# Special Advantageous Conditions for Stellar Photography in Colorado

By **PROFESSOR FRANK H. LOUD, COLORADO COLLEGE**

THE planet on which we dwell has, it must be confessed, in common with other beings of finite excellence, "the defects of its virtues." Consider the atmosphere, without it the world would be an arid waste, scorched by day and frozen every night. If with the growth of life there come some trifling disabilities, these may well be accepted without complaint. Yet suppose the case were with the earth as with the planet Jupiter, involved as it is in so deep and cloudy an envelope that inhabitants like ourselves could probably never have learned of the existence of the sun, moon or star, completely and forever ignorant of all the boundless universe save their single orb. All these things in heaven are unknown to our Jovian neighbors, just as more things, according to the pregnant saying of Hamlet, are undreamt of in our own, hidden, it may be, by some unsuspected obstruction, in itself as close and familiar to us as their murky air to them.

Be this as it may, we can congratulate ourselves that in atmospheric supply, the earth enjoys the "golden mean." There is here abundance for life, yet not enough to destroy vision, though there be enough to abridge, impair and distort it. A contrast to the too plentiful atmosphere of Jupiter is offered by the airless moon. The expansionists of the future "federation of the world" will perhaps, sigh like Alexander, for extra-terrestrial territory to overrun, if

at Arequipa, Peru, Lick Observatory maintains another at Santiago de Chile. While Chicago and Yale universities look to Californian mountains for the prosecution of some of their most important astronomical researches. In like manner Colorado with the adjacent territories will no doubt prove itself, in the years to come, a strategic ground whence the conquests of science will be extended over the universe of stars. A reason for this prediction, which will at once suggest itself, is found in the fact that Colorado stations, by virtue of their elevation, are outside of as much as one-fifth of the atmosphere, and of more than that fraction of the contained vapor.

But here an objector, familiar with the conditions under which telescopic observations have been made since Galileo first pointed his "optick tube," may raise the query, "Can you claim that Colorado's elevation secures uniform good seeing?" The reply in order to place the case fairly before a reader who is not a professional astronomer, requires first an explanation of a technical term, and then an estimate of the changes in relative importance of cer-

pointed out by Professor W. H. Pickering, that tropical stations are more likely than others to be free from this defect, confirms the obvious view that it is in some way caused by that mingling of diverse atmospheric currents which accompanies cyclonic storms. If this view be correct, there is little doubt that different parts of Colorado will be found to differ widely in the frequency of "good seeing." It may be anticipated that the northeastern portion will suffer from its proximity to the usual track of the cyclones, while the southwestern may approach the equability which Mr. Percival Lowell has found so greatly to his advantage in Arizona. In no part is there reason to suppose that the "seeing" will prove worse, even if so bad, as at the observatories where, nevertheless, most important work in the advancement of science has hitherto been performed, in New England and in the neighborhood of the Great Lakes.

But the so-called "good seeing" is, after all, only one of observation, and while to the visual observer it may be of vital importance, the case is far otherwise when we regard it from the point of view of the photographer. And this is in reality the true point of view to estimate its importance to the progress of science, for the photographic camera, in recent years, and more and more from year to year, has proved itself the most effective weapon of the astronomer. It has taken its place as the third member of a trio beside the telescope and the spectroscope, and is of equally indispensable utility as an adjunct to each of the other two. Now, although the leaps to right and left which are made by the image of a violently twinkling star, are doubtless most bewildering to the eye, they are not of any great length, nor can they greatly disturb the long steadfast gaze of the patient camera. On the human retina an impression lasts but the fraction of a second, but the photographic plate is able to accumulate, through an exposure of hours, the maximum effect of the rays which mark

the distinctness of the spectrum photographed, but may make it necessary to give a longer exposure.

Thus, to the photographer, length of exposure is the ultimate desideratum. And this consideration serves to equalize the advantages of different lati-

tudes, for the reason that they must depend, not upon a continuous record, but upon estimates made at specified hours. A sunshine record, on the other hand, can be had continuously maintained through the daylight hours. The

disturbance of distant objects, and of stars when near the horizon, also by the white color of the moon at rising or setting, as distinguished from the yellow or reddish tinge which is commonly seen at points nearer sea-level. It is a quality, however, which is especially likely to be impaired by local conditions. Thus from Nob Hill in the evening one may often discern the summits of the Spanish peaks at a distance of more than 100 miles, while on looking toward Colorado Springs, only two miles away, he sees the city immersed in a cloud of haze, the result of the smoke from hundreds of soft-coal fires.

The following short table from "Colorado Weather" for December 1899 shows the number of hours of sunshine photographically registered for the first ten months of that year.

Stations	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Julesburg	191	186	244	212	247	230	230	230	230	179
Georgetown	154	140	187	194	206	196	220	196	196	164
Colorado Springs	186	161	214	220	224	274	242	254	246	196
Possible duration (C. S.)	281	280	250	281	280	280	280	280	280	280

In conclusion, the superiority of Colorado's qualifications for the work proposed cannot be better summarized than in a letter written by Professor E. C. Pickering, director of the Harvard college observatory, known throughout the world as unexcelled in the practical efficiency with which he has built up, in all its departments the splendid structure of modern astronomy. He wrote, outlining the plan which has since been carried into effect in the work in stellar photography lately begun at Nob Hill, as follows:

"The air of Colorado is exceptionally clear and is therefore particularly adapted to certain departments of astronomical research. The difference in the color of the sky and the whiteness of the moon is so marked to a visitor from the East, as to attract immediate attention. There is reason to believe that in departments of astronomical research the difference in the results obtained will be even greater. In the greater part of Europe, and the Eastern portion of the United States, a limit is soon found in the length of exposure that can be used in photographing the stars. Owing to the haziness of the air,

fail to produce an effect upon the plate. On the other hand the Colorado sky can be found where these effects are almost insupportable, and it is believed that results could be obtained there, which would be wholly beyond the reach of ordinary astronomical observation. It is therefore of great importance to have in Colorado a series of special instruments for the study of these advantages rather than to duplicate work already in progress at other observatories. A station possessing similar advantages has already been established by the Harvard college observatory at Arequipa, Peru. Much work has been done there on the southern stars, which, when extended to the northern stars at existing observatories, does not give results of equal value, on account of the haziness of the air. A striking example of this kind is the work now obtained with small anastigmatic lenses. One of these instruments, having an aperture of one inch and focal length of thirteen inches, with exposures of one hour, photographs stars of about the twelfth magnitude. A large portion of the sky appears on each plate, and, using long exposures, the details in the structure of the Milky Way, and therefore of the stellar universe, are strikingly depicted.

"It seems therefore desirable that the instrument in use at Arequipa, Peru, should be duplicated at Colorado Springs, and similar work undertaken with it, each instrument photographing a portion of the sky, which would be below the horizon of the other."

The plan outlined by Professor Pickering has been followed with no substantial change, and though the attempt is still in its initial stage, the first fruits of its results point to the realization of his predictions of success.

## CAPTAIN ROOSEVELT, STEAM-BOATMAN.

It is an almost forgotten fact that President Roosevelt's grandfather was the first man to navigate a steamboat on the Ohio and Mississippi rivers. Capt. Roosevelt was a close personal friend of Robert Fulton, inventor of the steam craft. Soon after Fulton's second successful voyage on the Hudson, the captain conceived the idea of launching such a craft on what was then western waters. In the spring of 1811 the vessel was launched at Pittsburg and the president's grandfather began his voyage to the gulf. He entered the Mississippi during the throes of the earthquake







STELLAR CAMERA USED AT NOB HILL.

The wheel, which moves at the rate of a complete revolution in twenty-four hours, is advanced each second by the electro-magnet. The current which actuates the latter is closed by the beat of the pendulum in the clock.

they would succeed in annexing our satellite, what joys would await the astronomers who accompany the army of invasion! The first hour of occupation of the new province would teach them more of the solar corona, for example, than has ever yet been glimpsed. The first month would give them volumes of new information regarding both stars and planets.

In the absence of facilities for lunar travel, it has become more and more an object of concern with astronomers, in the selection of sites for observation, to seek out those where the atmospheric conditions will be most advantageous. They thus attempt to secure in the greatest attainable degree the same freedom from hindrances to observation which only a station beyond the atmosphere could afford in perfection. Without question the regions where these conditions occur will ultimately be occupied by investigators from all parts of the earth. Already Harvard Observatory has its auxiliary station

tain atmospheric qualities, due to the modern application of photography.

What is said in the present paper of Colorado in relation to its atmospheric advantages is to be understood in general as applying as well to New Mexico and Arizona.

Every one who is in the habit of studying the sky through the eyepiece of the telescope, attaches especial importance to that condition of the air which secures steadiness of stellar images, and this has come to be called "good seeing." It is the contrary quality, too often prevailing in the air of nearly every part of the United States, which causes the stars to twinkle when seen with the naked eye, and which makes the field of view in the telescope appear to "boil," the images dancing capriciously about in a way most confusing to the vision of the baffled and impatient observer. Precisely how this unfortunate result is brought about is not perfectly known, but the fact

after all, only one by observation, and while to the visual observer it may appear of little importance, the case is far otherwise when we regard it from the point of view of the photographer. And this is in reality the true point of view to estimate its importance to the progress of science, for the photographic camera, in recent years, and more and more from year to year, has proved itself the most effective weapon of the astronomer. It has taken its place as the third member of a trio beside the telescope and the spectroscope, and is of equally indispensable utility as an adjunct to each of the other two. Now, although the leaps to right and left which are made by the image of a violently twinkling star, are doubtless most bewildering to the eye, they are not of any great length, nor can they greatly disturb the long steadfast gaze of the patient camera. On the human retina, an impression lasts but the fraction of a second, but the photographic plate is able to accumulate, through an exposure of hours, the maximum effect of the rays which mark the central position of the stellar image. Hence "bad seeing" does not prevent good photographic results.

It may be supposed that, in proportion as the magnifying power of the instrument is increased, this indifference to the effect of "bad seeing" will be diminished. This is true as regards some species of work, but not all. To discuss the question in detail would be impossible in a popular article, but a single citation will suffice to show—and that on an unimpeachable authority—that there are fields of astronomical work, of the greatest importance to the science, and suited to the employment of the highest optical aid, in which, for substantially the same reason as already indicated, the quality of steadiness is by no means indispensable. The authority meant is that of Professor Chas. A. Young, who in his recent treatise, "A Manual of Astronomy," (1902) has occasion to contrast the performance of the spectroscope in its usual form—that in which the light is admitted through a narrow slit and falls ultimately upon a photographic plate—with a related, but different instrument. Of the latter he says:

Moreover it gives well-defined images only when the air is very steady and the star images quiescent—a condition of comparatively little importance with a slit spectroscope, since atmospheric disturbances with such an instrument, do not



CLOCK USED IN STELLAR PHOTOGRAPHY AT NOB HILL.

At the bottom of the case is seen the magnetic apparatus which closes the circuit and regulates the motion of the camera.

tudes. For the longest attainable exposure is usually though not inevitably—that which may be obtained in a single night. And if it should prove true, as Professor W. H. Pickering contends, that "good seeing" in its perfection is to be found within the tropics alone, it is incontestable that longer nights are to be found elsewhere.

Having considered, at greater length than perhaps is necessary, that condition of the air which secures steadiness of a telescopic image, it remains to notice other qualities, to the photographer of paramount importance, especially transparency and the absence of clouds. The former determines the degree of effectiveness of an exposure while it lasts, the latter assures the possibility of long continued exposures which in regions of abundant clouds would be interrupted and aborted. Statistics of cloud-frequency, while usually found in meteorological com-

United States weather service presents charts of the duration of sunshine in percentages of the whole amount possible, and these appear periodically in the monthly weather review. The latest annual summary published, that for 1903, shows that in Colorado the sunshine frequency increases from somewhat under 50 per cent in the northeast to more than 70 per cent in the southwest. This, however, is not an entirely accurate index of the frequency of clear nights, since the summer cloudiness, especially, has a marked diurnal period, the cumulus clouds of the afternoon entirely disappearing before night while the hours between midnight and dawn are still less frequently clouded than those of the evening.

Transparency of the air depends in a great degree upon elevation, and is a conspicuous quality of the mountain atmosphere of Colorado. It is indica-

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FIELD OF STARS IN ANDROMEDA. Taken at Nob Hill, Colorado Springs.

# The Gentle Art of Cooking at Its Highest in America

**N**EW YORK, Jan. 22.—It was once said by a European wit that the art of dining could not flourish in a republic. He

electric lights. The floors are of marble. The walls and ceilings are of glistening white tiles, and the tables and counters are of heavy plate glass.

## Europeans must admit now they have nothing to teach us about

It might be thought that such an air far from those charged with the elaborate equipment in charge of a class hotel and restaurants. But the high salaried force, would require the expenditure of a fortune by one who of the big bangs given in the city.



# OBSERVATORY TO BE BUILT ON NOB HILL

## Will Be Conducted Under Supervision of Harvard University for the Stellar Photography--Splendid Site Secured.

Nob hill is to be the site of one of the finest stations for stellar photography in the world.

Thomas H. Savery of Denver, president of the Rocky Mountain Paper company, has just made a gift to the Western Association of Stellar Photography of four lots near the end of the car line at Nob hill. The transfer of the land was made through C. P. Bennett, and the property consists of lots 9, 10, 11 and 12, in block 33, Grand View addition, the north half of the southwest quarter of the block.

It is agreed by the association that the grounds shall be beautified by trees and buildings. The announcement is made that buildings and an observatory will be erected where, under the supervision of Harvard university, the heavens will be photographed with cameras, the best human skill has produced.

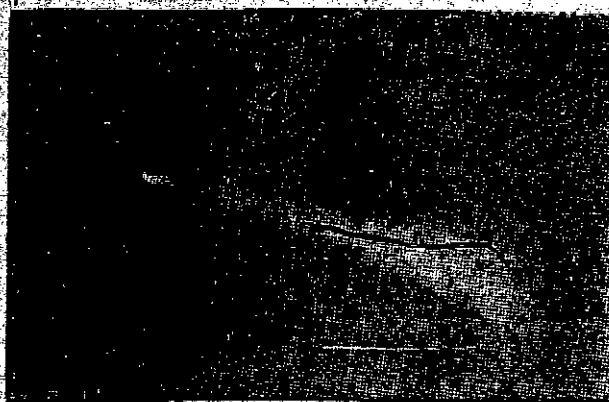
During the last year, experiments have been made at Nob hill by Dr. Frank H. Loud of Colorado college with a camera and apparatus sent

here by Harvard university for that purpose, and it is the success of these experiments that has brought about the enlarging of the station and the work.

The selection of Colorado Springs is made because of the superior atmospheric conditions, the climate, the altitude, and the fact that the close proximity of the mountains prevents vibrations of the earth. There is another station of this character in Peru.

The officers of the association will start immediately upon the work of raising the funds and making arrangements to begin work on a permanent and important scale. Dr. E. C. Pickering of Harvard college observatory is president of the Western Association of Stellar Photography; Dean Herbert A. Howe, director of the Chamberlin observatory of Denver university, is vice president, and Dr. F. H. Loud, director of Wolcott observatory and head professor of astronomy at Colorado college, is secretary-treasurer. The association was organized last October.

# MUCH-DISCUSSED HALLEY'S COMET IS PHOTOGRAPHED AT NOB HILL OBSERVATORY



PICTURE OF HALLEY'S COMET.

Taken by C. M. Paquin at Nob Hill Observatory.

A photograph of Halley's comet, the first that has been clear enough to reproduce by newspapers, was taken last week by the Nob Hill observatory of the Western Association of Stellar Photography. A number of pictures of the comet have been obtained from this point, but the one reproduced is the best of all. The instrument used for taking the photograph is one of three in the world, and the exposure lasted for half an hour. The usual exposure for taking a photograph of an ordinary star is four hours.

The comet can be plainly seen in the morning shortly after 3 o'clock, at a point almost due east, and many Colorado Springs people are either staying up, or setting the alarm clock, in order to view the heavenly visitor. The

comet is constantly growing brighter, and will be at its brightest about May 17 and 18, when it will be "only" 13,000,000 miles away. After May 18, when the earth passes through the comet's tail, which is about 15,000,000 miles long, the comet may be seen in the western sky just after sunset. It will gradually grow dimmer, however, as it will then be passing from us at a rate of 40 miles a second.

The other two machines for taking photographs of the comet are located in the Arequipa, Peru, observatory, and Harvard university. Each instrument cost \$700. Professor Pickering of Harvard university is president of the Western Association of Stellar Photography. Professor F. H. Loomis of this city, one of the officers, is in charge of the local observatory.

morning church to prepared.

Miss E. Kan., is a will be en phone con

Floy B. man of the Will," with the Bapti

Charles Leadville and are n coin aven

E. D. F. of the Re church, w speak at day.

The Col will give church T is' consid resenting

\* The Re been spe Chicago' movemen home abo

A large O'Neill of day night O'Neill ha mation.

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CITY OFFICIALS VISIT

DESECHO SITE ON DEAK

Colorado City News